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FY87 EVALUATION OF SHIPBOARD ELECTRO-OPTICAL APPARATUS FOR USE IN LAW ENFORCEMENT AND SEARCH

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U.S. COAST GUARD RESEARCH AND DEVELOPMENT CENTER AVERY POINT, GROTON, CONNECTICUT 06340-6096

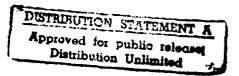


FINAL REPORT DECEMBER 1987



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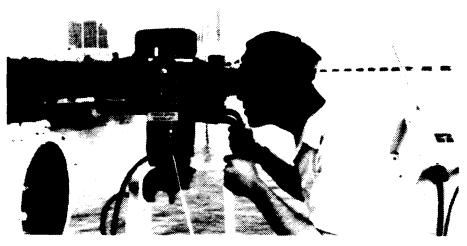


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Thanks should also be given to the Naval Sea Systems Command (W. Noyes) and to the Naval Weapons Supply Center (L. Boyd) for lending the Coast Guard a Model KAS-1 FLIR and for personal instructions by L. Boyd on its use. This unit was installed and operated successfully aboard the CGC VIGOROUS. Appreciation is likewise given for the effort of the Naval Surface Weapons Center (S. Herndon) for modifying the contract with Texas Instruments to permit the R&DC to rent the instrument installed on the CGC DECISIVE.

1.0 EXECUTIVE SUMMARY

Coast Guard operational requirements for electro-optic sensors for medium and high endurance cutters call for night classification of vessels at 20,000 yards and observation of deck details at 10,000 yards. As an "interim solution" for meeting the requirements, a set of "low cost" unstabilized FLIR units was tested. Three unstabilized Texas Instruments units which were variations of the Navy AN/KAS-1 Chemical Warfare Detector were tested—one from shore, one on the CGC VIGOROUS, and one on the CGC DECISIVE. The unit tested on the DECISIVE was fitted with a video pickoff, display, and tape recorder. For the other units individuals recorded details seen, ranges, and ambient conditions in logs. Magnifications available on the sensors were 3X and 9X. The narrower field of view (9X) was 1.1° vertical X 2.2° horizontal. The stated resolution was 0.13 mrad.

The tests on the VIGOROUS were performed from March 6 to April 17, 1987 off the east coast of North America at latitudes from 42° 30' to 18° 40'. The tests on the DECISIVE were performed from May 19 to June 17, 1987 in the Gulf of Mexico and the Caribbean Sea at latitudes from 26° to 18° .

The tests included detection and classification of ships and observations of activities on deck at various ranges with the FLIR sensors. Because of operator difficulties with an unstabilized sensor, search was performed efficiently only in brief tests with the unit placed on the shore of Long Island Sound. In all cases logged, initial detection was obtained by the ship's radar or binoculars (Big Eyes).

Maximum classification ranges for large vessels were from 27,000 yd in northern latitudes to 6,000 yd in southern latitudes. The ranges for classifying fishing vessels was from 26,000 to 4,000 yd. The classification and deck detail observation ranges demonstrated in tropical waters thus

fell significantly below the stated 20,000 and 10,000 yard requirements. Large vessel maximum ranges were correlated with the absolute humidity content of the atmosphere. This is a primary cause of loss of image contrast at these (8 to 12 microm) wavelengths. From the maximum range vs absolute humidity observations and weather data on mean temperatures at various locations around the CONUS, it was concluded that this type of FLIR could meet a 20,000 yard classification requirement only in the winter half of the year at latitudes north of the 40'th parallel in the Atlantic and north of the 30'th parallel in the Pacific.

Details as small as a man on deck were seen reliably with ranges of 2,000 yards or less. Increasing the range at which small deck details can be observed would require both less signal attenuation by the atmosphere and higher resolution in the sensor.

The tests gave qualitative confirmation of the improvement in imaging through thin nascent (small particle) fog and haze over imaging with visible light.

Tests of the NVS-500 night sight and previous experiences of the ships' personnel showed that this instrument was useful only for locating glows from ships over the horizon and for examining unlighted ships. The presence of any deck or running light tended to blank other features on the ships.

From the image motion remaining after manual stabilization, as observed in the video recordings, it is concluded that automatic stabilization is mandatory when the ship roll and pitch are over five degrees.

Since classification ranges in tropical waters were found to be far less than the stated requirements, the R&D Center recommends that a study be performed to ascertain if the response of the instruments can be increased by optical filtering or by selecting a new wavelength band. Also the study should include consideration of how the resolution of the instrument can be improved by a factor of two or greater.

2.0 ADMINISTRATIVE BACKGROUND

Coast Guard Headquarters' Office of Operations provided operational requirements for shipboard electro-optical sensor systems for Coast Guard Medium and High Endurance Cutters (G-OLE memo 3900 of 9 March 1983). Requirements called for a stabilized electro-optical system with which the operator could:

- a. "Classify radar targets at 10 miles (20,000 yards)".
- b. "Observe ship deck details at 5 miles (10,000 yards".

Control was to be from within the ship.

As an interim solution to these requirements, G-DST identified several "low cost", "light weight", unstabilized FLIR's (Forward Looking Infra Red viewing apparatus) which could partially meet primary requirements. One of these, an AN/TAS-6 Night Observation Device, was lent to the R&D Center for shore-based performance tests. Equivalent devices hardened for the marine environment were to be obtained, installed and tested similarly. Capabilities of the devices for searching were also to be assessed.

During the performance of the task, the R&DC was also requested to determine the utility of the NVS-500 night viewing apparatus carried on many Coast Guard ships.

3.0 OPERATIONAL TESTING

3.1 Operational Requirements

The primary requirements referenced in Section II were interpreted as follows:

- a. classify a large ship as to type (from size and shape details) at a range of 20,000 yd.
- b. classify smaller ships, e.g., fishing vessels, (from observing deck and mast details) at a range of 10,000 yd.
- c. determine ranges at which the NVS-500 could perform the classification tasks above.

In addition to the testing called for by the primary requirements, tests were performed to determine the ranges at which men could be observed on deck and to determine the utility of the IR (Infra Red) apparatus used as a search tool.

3.2 Data Requirements

The primary emphasis for testing FLIR devices is to document the capability of the devices in helping law enforcement personnel perform their missions. Since overall performance is a function of both the Law Enforcement scenario and environmental conditions, it is necessary to document both actions and ranges of targets and ambient weather (including thermal) conditions. In this report observations of target ranges and ambient conditions are correlated where possible and overall results are summarized.

3.3 Imaging Apparatus Tested

Three sets of infrared imaging apparatus manufactured by Texas Instruments were tested. The core element of each was one common module FLIR assembly. The properties of the assembly are given in Table I.

TABLE I

ELECTRO-OPTICAL CHARACTERISTICS OF COMMON MODULE FLIR

	Wide Field	Narrow Field
Field of View	3.4°(V)X 6.8°(H)	1.1°(V)X 2.2°(H)
Magnification	3X	9X
Resolution	0.4 mrad	0.13 mrad
Display Reticle Scale	4.91 mrad/sm div	1.64 mrad/sm div
Minimum Resolvable Temperature Difference	0.3°C.(catalog); 0.5 to 1.0°C. (opera	tional test)
Entrance Aperture	105 mm	
Viewing Aperture (Biocular)	76 mm	
Display Color	green	
No. of Detectors	60	
No. of Horizontal Scan Lines	120	
Sensor Weight	24 lb.	

Items comprising the three sets of apparatus were as follows:

1. Shore-based apparatus:

Texas Inst. Model AN/TAS-6 Sight for US Army artillery-using pressure bottles for cooling and a battery power pack

Sensor Mounting Tripod

Polaroid Recording Camera

Laser Range Measuring Apparatus

2. Apparatus tested on CGC VIGOROUS:

Texas Inst. Model AN/KAS-1 Navy Sensor for chemical cloud detection--using ship's power for cooling and operation--used without IR wavelength filters. See Frontispiece.

Pedestal built by R&DC, modified from Navy design to give adjustable height (see Figure 1).

Thermal Target for checking apparatus sensitivity (see Figure 2).

3. Apparatus tested on CGC DECISIVE:

Texas Inst. Model AN/KAS-1 Navy Sensor, as above, but with video pickoff added by T.I.

Thermal Target for checking apparatus sensitivity

Pedestal built by R&DC, improved over unit used on CGC Vigorous (see Figure 3).

Infrared Lens Assembly used to double the sensor magnification, the "2X Extender"

Sony Model VO-5600 Video Tape Recorder for 3/4 inch tape--with remote control box and microphone, plus audio amplifier and speaker for playback

Sony nine inch Black and White Monitor --used on the bridge to observe the sensor output and tape playback

Time Code Generator for adding time to video recordings

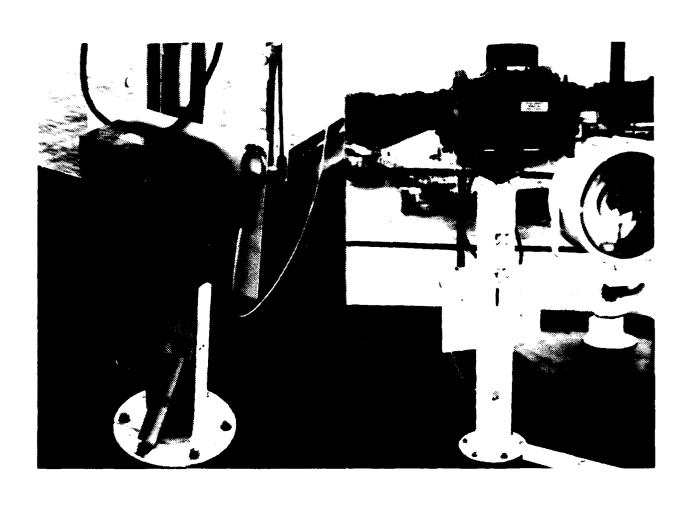
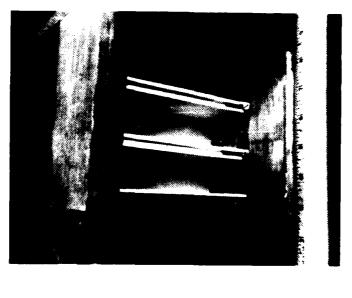


FIGURE 1. Front and Rear Views of Mount for AN / KAS-1 FLIR on CGC Vigorous



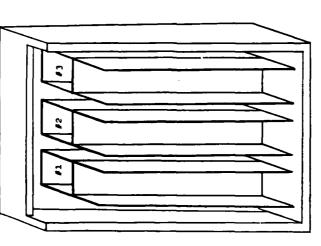


FIGURE 2. Construction of FLIR Sensitivity Tester

Reservoirs 1, 2, 3 are nearly filled with water at three different temperatures. Three aluminum "U" channels are thermally connected to the reservoirs so they perform as IR black bodies of bar shape.

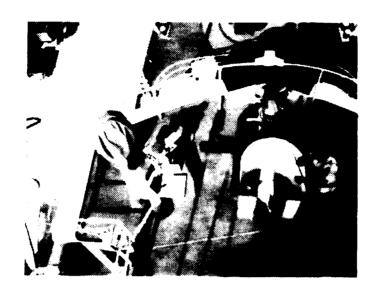




FIGURE 3. Installation of an AN / KAS-1 FLIR Sensor on Flying Bridge of CGC *Decisive*

Power Line Conditioning Apparatus assembled by R&DC for protecting apparatus from line transients

NVS-500 Monocular Night Viewing Intensifier for visual light observations

Apparatus Set No. 1 was used at Avery Point to observe the laboratory's 42 ft UTB at various ranges in Long Island Sound.

Apparatus Set No. 2 was placed on the flying bridge of the CGC VIGOROUS as shown in Figure 1. The sensor was at an elevation of 58 ft. Sizes of targets in reticle units were recorded by the crew. These measurements could have been converted to ft units.

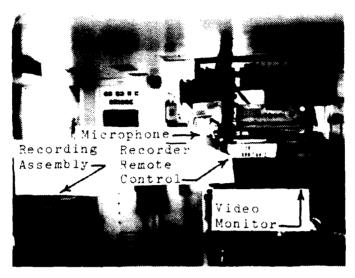
The sensor of Apparatus Set No. 3 was placed on the flying bridge of the CGC DECISIVE as shown in Figure 3. Its elevation was also 58 ft. The remote control box, microphone, and speaker were located in the bridge as shown in Figure 4. The tape recorder, time code generator, and power conditioning assembly were placed in a relay rack assembly on the floor in the rear of the bridge as also shown in Figure 4. Stadiametric measurement of target size was not employed.

3.4 Test Locations

Locations for the tests performed with the three apparatus sets were the following:

Apparatus Set No. 1 was tested with a largely over water path on the eastern end of Long Island Sound.

Apparatus Set No. 2 was tested on the March-April 1987 cruise of the CGC VIGOROUS. Tests were performed on passages



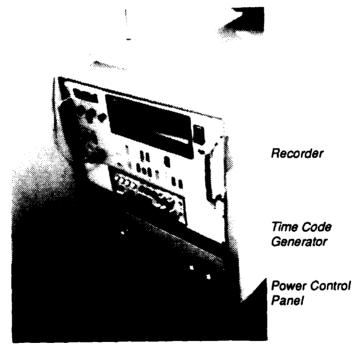


FIGURE 4. Installation of Video Equipment on Bridge of CGC Decisive

from Groton to Miami to the Bahamas to Haiti to the Bahamas to Portsmouth to Nova Scotia to New London. Details of the Groton to Miami passage are given in the narrative account of Appendix A.

Apparatus Set No. 3 was tested on the May-June 1987 cruise of the CGC DECISIVE. Tests were performed on passages from St. Petersburg to the Gulf of Mexico to Puerto Rico to Martinique to the Caribbean to St. Petersburg. Details of the St. Petersburg to Puerto Rico passage are given in the narrative account of Appendix B.

4.0 MEASUREMENTS OF PERFORMANCE

4.1 Shore-based FLIR Observations

4.1.1 Observation of Details

A set of shore-based inspection tests was performed to indicate the performance of the FLIR apparatus under optimum conditions. For these, elements of Apparatus Set No. 1 were used. The tripod-mounted AN/TAS-6 unit was located in the R&DC at an altitude of 90 ft and 800 ft from the shore of Long Island Sound. The target was the laboratory's 42 ft UTB, which was taken to ranges of 4, 3, 2, 1, and 1/2 nmi and was deployed at a variety of target angles. Observers using the FLIR noted apparent height and width values of the boat in reticle units and any activities on board the UTB. Target range was obtained separately with the laser ranging device.

Ambient conditions for the first three sorties are given in Table II. The corresponding activities observed on the boat and measurement accuracies are given in Tables III.A and III.B. From actual measurements one observes that lengths are determined with satisfactory accuracy, but cabin heights are typically overestimated—perhaps because of the presence of a small mast and radar unit mounted on the cabin.

TABLE II AMBIENT CONDITIONS

Sortie and Date	Time	Wind Speed	-	Cloud Cover	Visib.	Air Temp.	Water Temp.	Precip. Water/mi*
•		(kt)	Ht(ft)	(%)	(nmi)	(deg F)	(deg F)	(mm) .
1;02/04	0945- 1140	9-12	1	45	10-15	43	41	12.5
2;02/13	1330- 1500	3-5	<1	100	10-15	34	39	9.5
3;03/26	1930- 2100	0-5	0	00	05(in haze)	46	42	12.9

^{*} Precipitable water per mile is the thickness of liquid water which would result if the absolute humidity in the air was condensed in a sheet. This factor, pertinent to the transmission of infrared radiation will be used later.

TABLE III.a
SHORE-BASED OBSERVATIONS OF 42 FT UTB

1 7,250 Pilot house and mast 1 4,900 Man or crane on deck 1 3,000 Man on deck 1 1,700 Man on deck; crane arm; hay bale thrown overb. 1 900 Arms, hands of men on deck 2 3,000 Man on deck 2 1,600 People on deck; 2 persons sitting on stern; had bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 2 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck 3 1,070* Men seated on stern; flag	Sortie No.	Range (yd)	Object or Action Seen
<pre>1 4,900 Man or crane on deck 1 3,000 Man on deck 1 1,700 Man on deck; crane arm; hay bale thrown overb. 1 900 Arms, hands of men on deck 2 3,000 Man on deck 2 1,600 People on deck; 2 persons sitting on stern; had bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 4 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck</pre>			·
1 3,000 Man on deck 1 1,700 Man on deck; crane arm; hay bale thrown overb. 1 900 Arms, hands of men on deck 2 3,000 Man on deck 2 1,600 People on deck; 2 persons sitting on stern; had bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 4 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	1	7,250	Pilot house and mast
1 1,700 Man on deck; crane arm; hay bale thrown overb. 1 900 Arms, hands of men on deck 2 3,000 Man on deck 2 1,600 People on deck; 2 persons sitting on stern; has bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 4 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	1	4,900	Man or crane on deck
900 Arms, hands of men on deck 3,000 Man on deck 1,600 People on deck; 2 persons sitting on stern; has bale thrown overboard 800 Flag, radar, hand rails, people on deck 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	1	3,000	Man on deck
3,000 Man on deck 1,600 People on deck; 2 persons sitting on stern; had bale thrown overboard 800 Flag, radar, hand rails, people on deck 400 Man using a binocular 4,300* Boat wake 2,000* Man walking on deck	1	1,700	Man on deck; crane arm; hay bale thrown overb.
2 1,600 People on deck; 2 persons sitting on stern; had bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 2 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	1	900	Arms, hands of men on deck
bale thrown overboard 2 800 Flag, radar, hand rails, people on deck 4 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	2	3,000	Man on deck
2 800 Flag, radar, hand rails, people on deck 2 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck	2	1,600	People on deck; 2 persons sitting on stern; hay
2 400 Man using a binocular 3 4,300* Boat wake 3 2,000* Man walking on deck			bale thrown overboard
3 4,300* Boat wake 3 2,000* Man walking on deck	2	800	Flag, radar, hand rails, people on deck
3 2,000* Man walking on deck	2	400	Man using a binocular
e, ever management door	3	4,300*	Boat wake
<pre>3 1,070* Men seated on stern; flag</pre>	3	2,000*	Man walking on deck
	3	1,070*	Men seated on stern; flag

^{*} Using 3X (rather than 9X) magnification

TABLE III.b
ERRORS IN SHORE-BASED MEASUREMENTS OF 42 FT UTB

<u>•</u>	Sortie No.	Boat Length Std. Dev.(ft;%)	Boat Cabin Height Std. Dev. (ft;%)	
	1	1.5;04	8;80	
	2	03;07	4;40	
	3	03*;07	12*;120	

^{*} Using 3X (rather than 9X) magnification

The Sortie No. 1 observer was BM2 Ensminger, who was completely familiar with the UTB, having served as its cox'n. The No. 2 and No. 3 observer was SN Meaney, who had served on the boat, but was not so familiar with taking measurements.

Examples of the quality of shore-based images are presented in the prints of Figures 5.a to 5.h. The observer of an actual image perceives somewhat more detail, since he can compare several images, and the images do not suffer the loss of detail occurring with photographic reproduction.

4.1.2 Search with the FLIR

Search was performed only from a land sight, since having adequate resolution required use of the narrow field of view, and operators of apparatus aboard the moving ships were able to perform a search only with the wide field of view. With the land-based searches Apparatus Set No. 1 was used at an altitude of 55 ft above sea level. The operator scanned the sensor continuously in azimuth over an angle of 90 deg in about 3 1/2 minutes. Scanning was in one direction only and scans were repeated until the target was detected. With the elevation angle set to just bracket the horizon, it was not necessary to scan the instrument in elevation. With the 9X magnification used, the field of view at this elevation covered ranges from about 1000 yd to the horizon.

When each search began, the target, the lab's 42 ft UTB, proceeded from a greater-than-detectable range toward the observer at a speed of about five knots. The target range was measured when detection occurred.

Search conditions are given in Table IV.

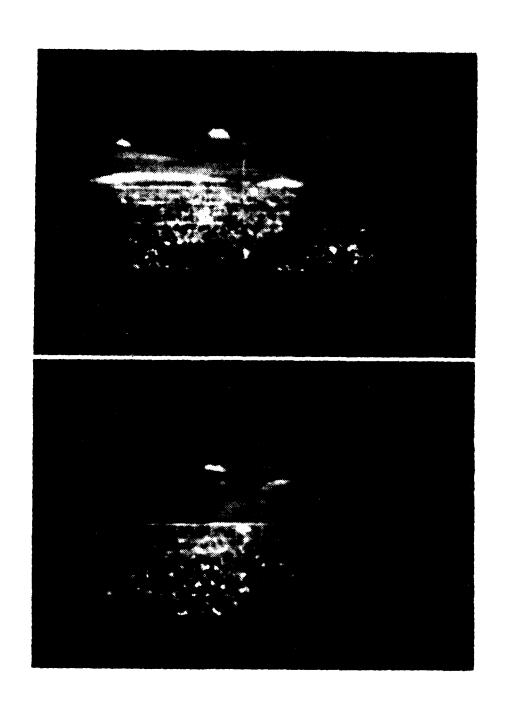


FIGURE 5a. Bow and Beam Images of UTB at 8,600 Yard Range — Sortie No. 1

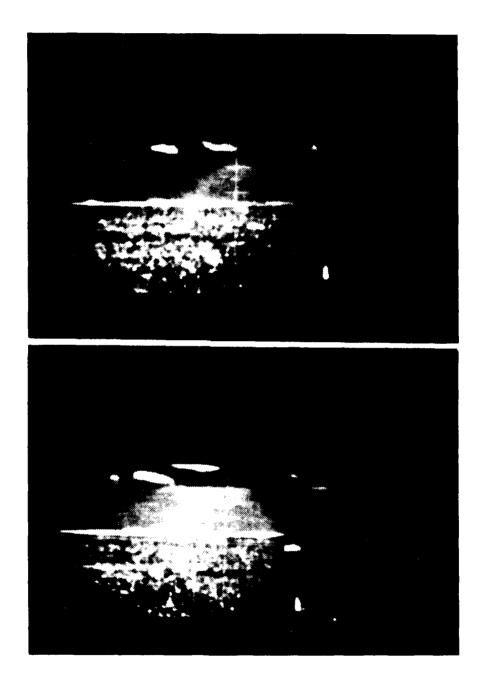


FIGURE 5b. Bow and Beam Images of UTB at 5,800 Yard Range — Sortie No.1

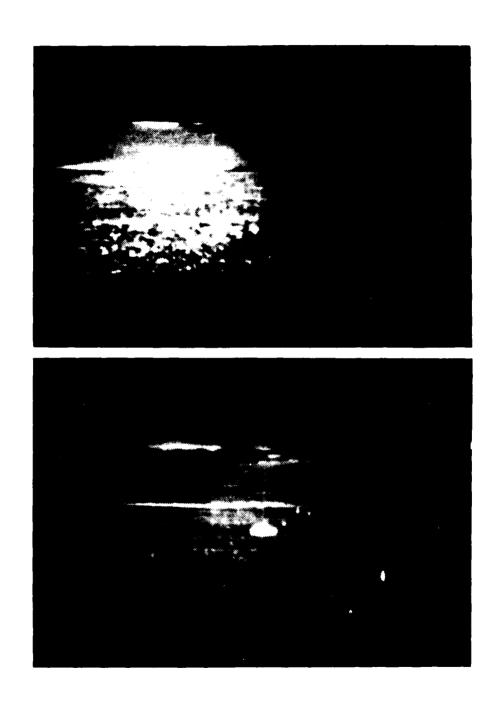


FIGURE 5c. Bow and Beam Images of UTB at 3,800 Yard Range — Sortie No.1

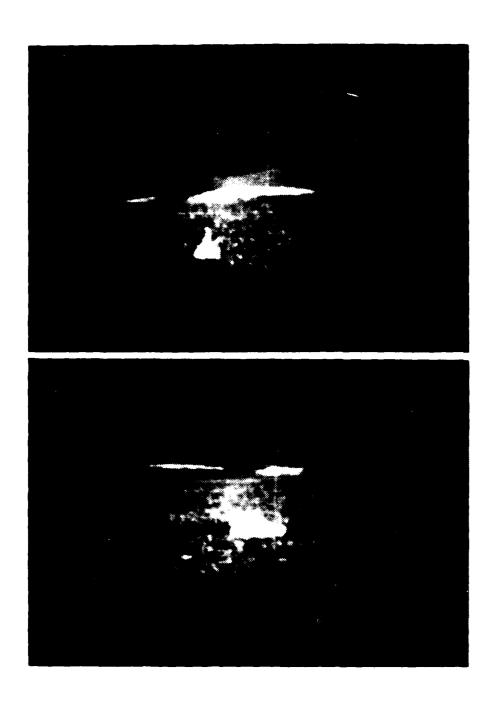


FIGURE 5d. Bow and Beam Images of UTB at 2,000 Yard Range — Sortie No. 1

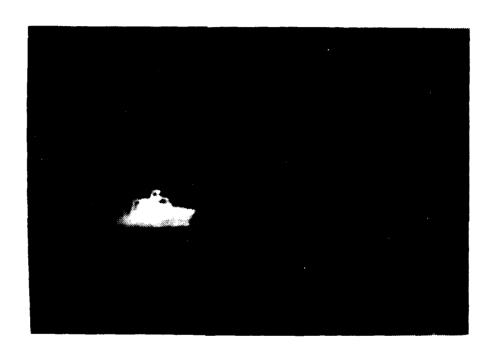


FIGURE 5e. Quarter Image of UTB at 900 Yard Range — Sortie No. 1

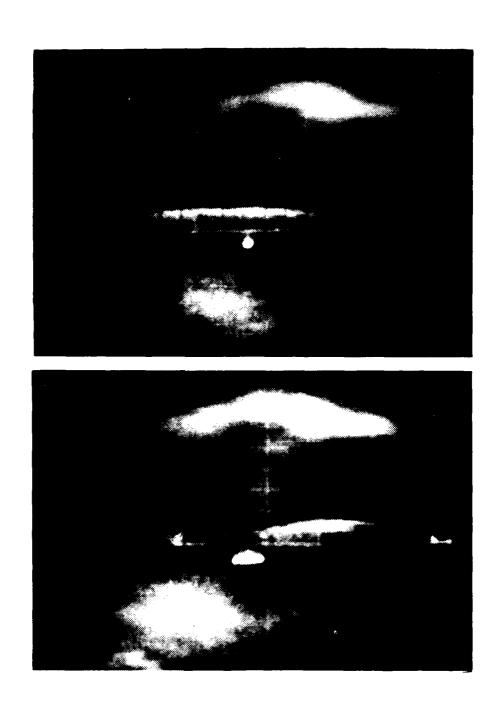


FIGURE 5f. Bow and Beam Images of UTB at 5,400 Yard Range — Sortie No. 2

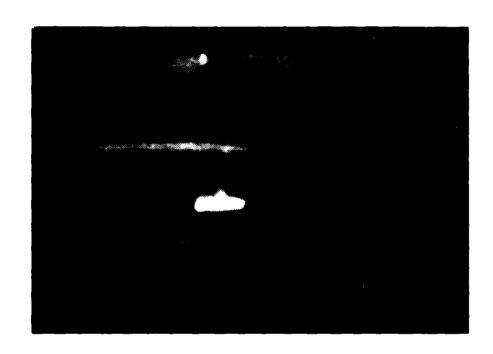


FIGURE 5g. Beam Image of UTB at 3,400 Yard Range — Sortie No.2

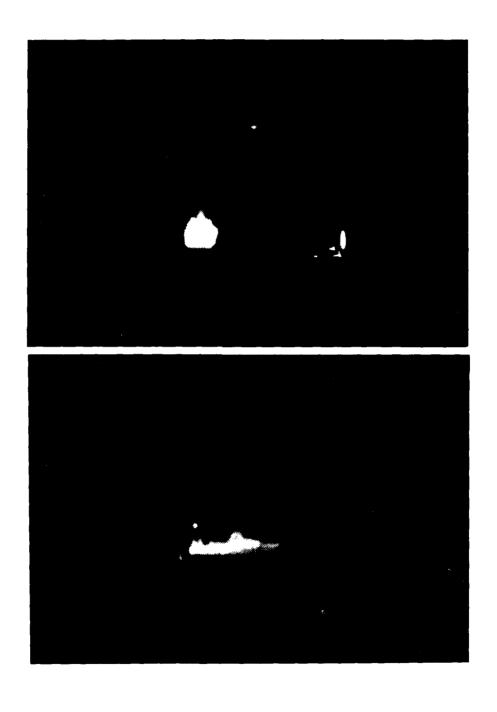


FIGURE 5h. Bow and Beam Images of UTB at 3,800 Yard Range — Sortie No. 2

TABLE IV
SEARCH AMBIENT CONDITIONS

Search Number		Time	Wind Speed(kt)	Sea State	Visib. (nmi)	Relative Humid.(%)	Air Temp.(°F)	Cloud Cover
1	6/30	2155	2	ı	07	94	70	7/8
2	6/30	2220	4	1	10			
3	6/30	2230	4	1	10			
4	6/30	2255	4	1	10			
5	7/1	2110	6	0	06	95(est)	68	8/8
6	7/1	2130	2	0	06			
7	7/1	2150	4	0	06			
8	7/1	2205	4	0	06			
9	7/1	2225	4	0	06			
10	7/1	2250	4	0	06			

With this search procedure, detection might have occurred at a time up to one scan period earlier if the scan had begun at another azimuth angle. On the average, assuming that the target would have been detectable, the detection would have occurred one half scan time earlier. The third, fourth, and fifth columns of the table following assume that the limiting detection range should be increased by the range travelled by the target at a speed of five knots in this time interval.

Detection results and precipitable humidity values are given in Table V.

TABLE V DETECTION RESULTS AND PATH HUMIDITIES

Search & Observer Numbers	Detection Range (yd)	Range 1/2 Scan Earlier(yd)	Target Width (mrad)	Target Height (mrad)	Precip. Water/mi (mm)
1;1	6160	6430	0.73	0.52	31.7
2;2	6470	6850	0.68	0.49	31.7
3;1	4620	5000	0.93	0.67	31.7
4;2	3870	4040	1.16	0.83	31.7
5;3	6370	6620	0.71	0.50	31.6
6;4	4340	4640	1.01	0.72	31.6
7;5	6390	6700	0.70	0.50	31.6
8;3	5030	5340	0.87	0.62	31.6
9;4	4670	4990	0.94	0.67	31.6
10;5	1990	2460	1.90	1.36	31.6
Mean; Std. Dev.	4990; 1430	5310; 1400	0.96;	0.69;	31.6

Observers were as follows:

- 1 SN A. Depaolo 2 MST3 P. Reilly
- 3 MST3 C. Weiller
- 4 MST2 D. Hutchinson 5 SA E. Daly

It should be noted that the search field of view contained confusing objects (buoys, rocks, and other boats), causing a few seconds delay in setting on the true target. The 42 ft UTB was distinguished from other objects by noting its size and its motion in the field of view.

4.2 Ship-based FLIR Observations

4.2.1 Ambient Conditions

Ambient conditions are given in detail in the FLIR and meteorology logs reproduced in Appendices C and D. Ambient parameters for the cruises of the VIGOROUS and the DECISIVE made at the times of FLIR observations are summarized in Tables VI.a and VI.b.

TABLE VI.a

AMBIENT PARAMETERS FOR VIGOROUS CRUISE

Parameter	Extreme Values
Wind Speed(kt)	2-28
Wind Direction	Variable
Sig. Wave Ht.(ft)	0.5-8
Pitch and Roll(deg)	0-3 (30 days); 4-10 (6 days)
Visibility(nmi)	2-10 (typically 10)
Air Temperature(F)	39-83
Prec. Water/mi(mm)	10.8-39.6

Precipitable water values for the VIGOROUS cruise are plotted at the end of Appendix D.

TABLE VI.b

AMBIENT PARAMETERS FOR DECISIVE CRUISE

Parameter	Extreme Values	Mean Value	Std. Dev.
Wind Speed(kt)	6-18	11.8	3.5
Wind Direction	East Quadrant		
Sig. Wave Ht.(ft)	2-5	3.4	1.2
Pitch(deg)	0-4	2.0	1.2
Roll(deg)	0-10	3.0	2.9
Visibility(nmi)	9-10		
Air Temperature(F)	80-83		
Prec. Water/mi(mm)	40.9-46.3	42.8	1.8

4.2.2. Maximum Classification Ranges for Large Vessels

The plots of Figures 6 and 7 show maximum ranges for large vessels vs. precipitable water/mile. The data points present the maximum ranges logged for the various contacts.

4.2.3 Maximum Ranges for Observation of Details

Figures 8, 9 and 10 show similarly obtained maximum ranges for fishing and sailing vessels and for deck rigging. Identification of these types of ships and of deck rigging represents a significant sensing of detail by the observers. Unfortunately the number of observations in the three categories made under widely varying humidities is less than would be desired.

4.2.4 Maximum Ranges in Low Temperature Fogs

A set of twelve observations from the FLIR log of the VIGOROUS cruise illustrate the performance of the FLIR in low temperature fogs. They are reproduced as Table VII.

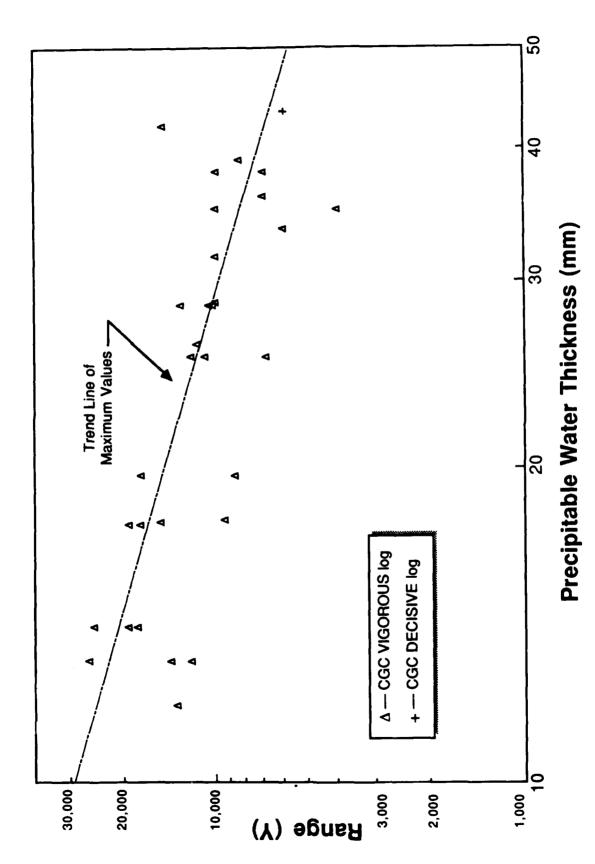


FIGURE 6. Maximum Observation Ranges for Freighters

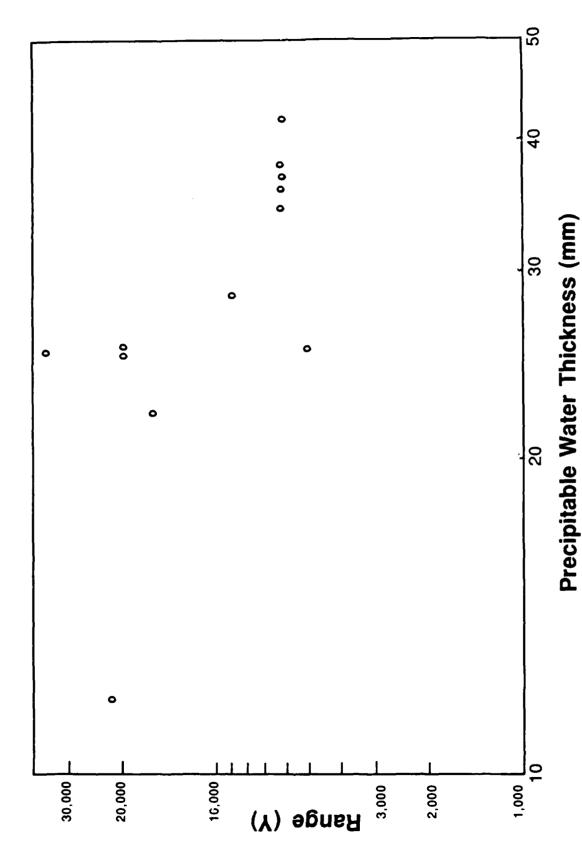


FIGURE 7. Maximum Observation Ranges for Tankers — from CGC Vigorous log

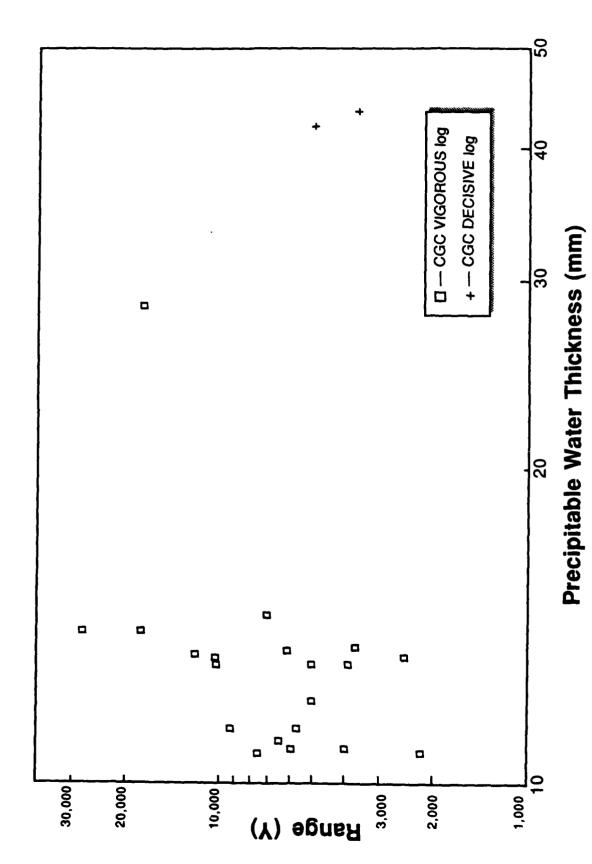


FIGURE 8. Maximum Observation Ranges for Fishing Vessels

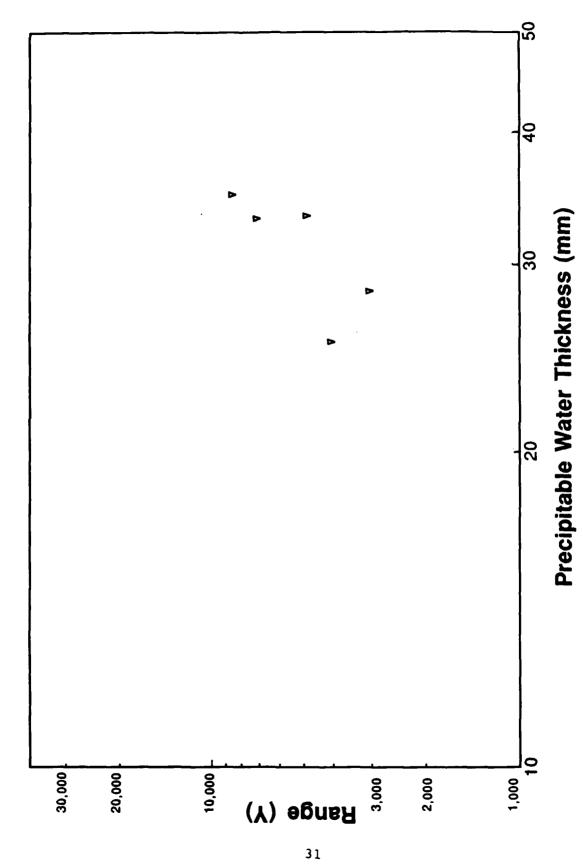


FIGURE 9. Maximum Observation Ranges for Sailing Vessels — from CGC Vigorous log

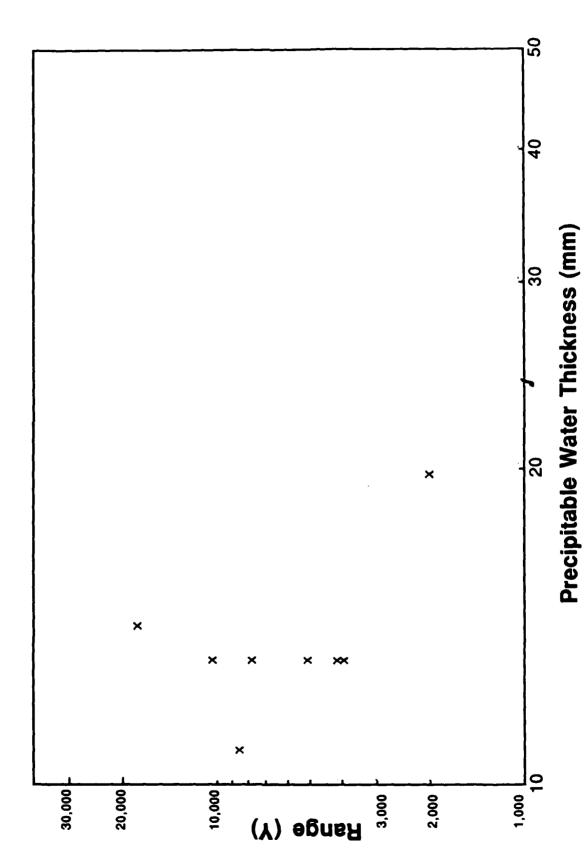


FIGURE 10. Maximum Observation Ranges for Deck Rigging — from CGC Vigorous log

TABLE VII FLIR OBSERVATIONS MADE IN FOG

Date	Time		Visib. (nmi)		Ship Type	Observations
4/5	1307	47 F	5	18,000	Frtr	Faint hull outline
4/5	1505	47 F	7	10,000		Only stack visible
4/5	1900	43 F	1/4			Only VIGOROUS bow vis.
4/6	2045	40 F	2	2,000	CGC VIGILANT	"Decent" FLIR image; Only stern light vis. with Big Eyes
4/6	2125	40 F	6	6,400	CGC VIGILANT	Good profile
4/6	2125	40 F	6	4,000	Fishing Vessels	Heat from lights and stacks
4/6	2145	40 F	8*	10,000	CGC VIGILANT	Slight profile
4/6	2245	41 F	9*	3,700	Stern Trawler	"Decent" image
4/6	2245	41 F	9*	22,000	Tanker	Strong image of stack and superstr. ;no hull
4/6	2300	41 F	10*	12,000	Tanker	Hull appears faintly
4/8	2205	39 F	8	2,210	Fishing Vessel	Superstr., rigging, hull visible
4/10	2208	47 F	9	10,000	Trawler	Rigging, superstr. visible

^{*}Estimated from log data

4.2.5 Quality of Images--Video Recordings

The quality of images recorded on the DECISIVE cruise can best be judged by seeing the two 3/4 inch VCR tapes included with this report and listening to the audio commentary on the tapes. These tapes comprise a set of samples from the set of seven original tapes recording test signals and at-sea observations. They shorten the observation time required by omitting periods of inconsequential activity or of little change in the scene. The narrative report of Appendix B provides additional details about the action taking place on the tape recordings.

4.2.6 Tests of the "2X-Extender" Magnifier

A lens assembly giving an additional 2X magnification (but no additional scan lines) was provided for the first leg of the DECISIVE cruise by Texas Instruments. Its effect may be seen on portions of the video recordings--from 19 May--2043 hrs to 20 May--2050 hrs. The only conclusion reached about its operation was that it cannot be used easily on an unstabilized mount because of the increased image motion which it generates. It might well be useful on a stabilized sensor for increasing the detail in clearly defined images. It cannot, of course, increase the contrast present in images.

4.3 Inspection with the NVS-500 Night Sight

Robert Barry recorded two trials of the Night Sight in Appendix B, saying that, "The recorder was started at a range of 1400 yards. I examined the contact with the NVS-500, but the anchor light and a light on the starboard side prevented seeing details until the boat was close aboard."--and--"Good detail on FLIR. NVS-500 image masked by lights; the outriggers were the dominant feature that was clear."

This effect was confirmed by a DECISIVE crewman who added that the night sight was useful for detecting glows from ships over the horizon or for looking at unlighted ships, but it was not useful for inspecting ships carrying lights.

4.4 Operator Image Stabilization and Eye Fatigue

4.4.1 Short Term Stabilization

Observations of the video recordings from the Vigorous cruise show that sensor operators were able to stabilize images to within peak-to-peak angles of about four milliradians when the ship's roll or pitch was of the order of two degrees (35 mrad). When ship motion increased to a maximum value, the stabilization was accomplished to within about 13 mrad. According to the operators, manual stabilization and operation become difficult to impossible when ship pitch and roll values exceed about ten deg.

4.4.2 Eye Fatique

The crews of the VIGOROUS and the DECISIVE indicated that the longest period which an operator could concentrate on an image is of the order of five to ten minutes. Then his eyes must be averted to reduce fatigue. For this reason search (and stabilization) by a single operator was difficult.

5.0 RANGE AND RESOLUTION LIMITATION THEORY

5.1 Range Limitations

In the transmission of IR radiation from a target to an observing device, the target radiation is absorbed and scattered by the intervening atmosphere, and spurious radiation from the background is scattered into the line of sight. This effect is similar to the effect observed with visible light. It leads similarly to a loss of image contrast and a consequent loss of

the ability of the observer to detect and/or identify a target. This loss of contrast has been described mathematically by Koschmieder's Law in an early report and further developed by Duntley (Reference 1). Their contrast loss equation is simply

 $C(R) = C_{O} \exp[-a(\lambda) R],$

where

C = (radiance of target-radiance of background)/
 radiance of background

C(R) = image contrast at the receiver at a range R
from the target

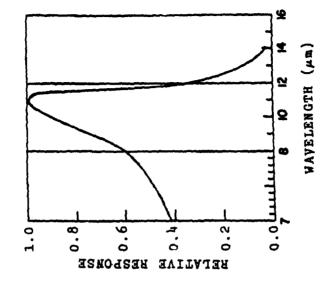
 C_{o} = contrast at zero range

a = rate of attenuation of contrast by absorption
 or scattering, and

 λ = wavelength of the radiation.

R = range from the target

In our case the attenuation of long wavelength IR radiation can result from absorption by water molecules in the atmosphere or by scattering and absorption by droplets (haze or fog). Figure 11.A is a plot of the absorption (actually transmission) characteristics of the atmosphere vs wavelength for humidity concentrations of 1, 10, and 50 mm of precipitable water. Figure 11.B is a plot of target emission combined with the response of the detectors used in the FLIR. One notes that the effect of increasing path water vapor is to reduce significantly the composite response (product of values on Figures 11.A and 11.B).



PRECIPITABLE Water

1 mm

8.55 5.55 11.11.11.

0.00

EDMATTIMEMART DIRENTEANCE

0.00

0.99

3

5000

50 mm

LO mm

FIGURE 11.

WAVELENGTH (Am)



B. Combined Relative Response from Target Emission and FLIR Detector

The absorption of IR radiation by water vapor across the transmission band varies almost proportionally with concentration and to a lesser degree with temperature*. typical conditions at sea the atmospheric relative humidity varies between 75 and 100 percent. To provide bogey values for the expected absolute humidity vs temperature, we have calculated the precipitable water/mile vs temperature for a nominal relative humidity of 85 percent. This is graphed in Figure 12. a non-foggy condition, the attenuation rate for IR radiation is approximately proportional to the precipitable water/mi, which is relatable to ambient temperature as in Figure 12. It remains to determine the proportionality coefficient, or, alternatively, to find the thickness of precipitable water at which a target can just be detected. This latter is done in a "Conclusions" section of the report.

5.2 Resolution Limitations

The resolution achievable with electro-optical apparatus is a thoroughly studied subject. For us a study by Johnson (Reference 3) of the US Army Engineering Research and Development Laboratory is particularly applicable. Johnson found that for a set of nine types of army targets (vehicles, tanks, guns, soldiers) the number of TV lines (resolution elements) required for determining target details in a display were as follows:

^{*}The subject is appropriate for further study, particularly to ascertain what increases in range can be achieved by changing the wavelength response of the detector in order to maximize radiation from a target and minimize line of sight absorption and scattering.

Action	TV Lines/ lesser dimension*	FLIR NFOV Angle (mrad)
Detection	2.0 ± 0.5	0.3 + 0.1
Orientation	2.8 ± 0.7	0.4 + 0.1
Recognition	8.0 ± 1.6 (class of object)	1.3 + 0.3
Identification	12.8 ± 3 (type in class)	2.0 + 0.5

Lesser dimension is height of vehicle, width of man, etc.
In our case it is height of ship.

To the tabulation we've added a third column giving the corresponding field angles in the common module FLIR in NFOV mode. Johnson's test conditions were:

- 1. High signal/noise ratio
- 2. High target/background contrast
- 3. No target motion
- 4. No background clutter

In our case with the common module FLIR operating in the narrow field of view, the 8 and 12.8 TV lines subtend field angles of 1.3 and 2.0 mrad (8 and 12 ft at one mile) respectively. These values will be compared with requirements in the section describing "Conclusions."

6.0. USERS' CRITICISMS

These were obtained from the final reports and from debriefings of the ship's personnel and the R&DC operators. Summaries are presented here.

6.1 Classification Range

VIGOROUS--"Up north contacts were picked up at great distances, up to 10 miles; FLIR generally did not pick up contacts well down south."

DECISIVE--"Outside Tampa Bay--the first ship observed was a 600 ft cruise liner.--Not until a range of approximately two miles was the ship identified by type with the FLIR."

--"Only on a very few occasions were any vessels visible through the FLIR at a range of over three miles.--- Between the latitudes of 15 and 12 degrees north we were not generally able to detect contacts farther than one mile."

6.2 Detail Observation Utility

VIGOROUS--Useful for picking up unlighted vessels at night.
"The FLIR is a valuable tool when searching for a specific target since nighttime profiling and sizing is accomplished."

DECISIVE--"On the occasions that we closed a vessel for LE purposes the device--allowed us to observe vessel type and construction, monitor crew movement, and examine possible heat sources prior to illumination and boarding. Once the boarding was in progress, the FLIR became insignificant for that vessel."

6.3 Major Equipment Items

VIGOROUS--"A remote bridge monitor for periodic scanning by bridge personnel or red-lens screening for the normal lookout's periodic scanning would help circumvent manning restrictions."

Mounting the FLIR sensor on top of the Big Eyes binocular for convenience of the lookout (eliminating the need for another watchstander) was suggested.

Automatic detection of targets would be desirable. Documenting of LE cases is necessary nowadays.

DECISIVE--"Resolution was a problem.--the video capabilities
require too much space."

Real time observation was even more useful than recording.

6.4 Minor Capabilities

VTGOROUS

The sensor image should be in red, rather than green, to permit the lookout to continue to be dark adapted.

The sensor stand should be stronger to reduce ship-induced vibration.

The sensor should be higher so that the obscuration is lessened.

DECISIVE

The time code generator should be easily settable and should have storage cell backup so that resetting would not be necessary after every power break.

Too much space was taken up by recording and control panels.

R&DC

The mount provided for the sensor by T.I. was defective in two ways. The tapered fitting used for quick release of the apparatus fitted poorly, allowing the apparatus to flop in its mount, instead of moving on well made bearings. Also the elevation yoke was sprung causing improper friction on the elevation bearings.

The viewer reticle should have only one cross-bar length to prevent confusion in ship size measurement when many operators use the viewer.

The optics and/or detectors associated with the video pickoff were loose and vibrated when the sensor was pointed at the horizon.

The connectors on the video cables were not durable for shipboard use--they were the BNC type.

A shield should have been provided to shield the infrared optics from spray in as far as possible.

The sensor's foam optics protector should have a positive lock in the operating position so that it will not be loosened by the air stream.

The apparatus manufacturer should provide the user with a simple thermal test device to verify its sensitivity and resolution.

7.0 CONCLUSIONS

7.1 FLIR Range Capabilities for Detection and Classification of Large Ships

If we assume that the "trend line" of Figure 6 represents the limiting range for classification of large ships, it would be instructive to predict the ranges obtainable at differing locations when humidity is the limiting factor. To do this, we selected fifteen offshore locations around the continental U.S. and in the Caribbean. For these we obtained mean July and January air temperatures. Then, assuming a bogey value of relative humidity of 85 percent, precipitable water per mile was obtained from Figure 12. With this as an input, we calculated mean maximum ranges for these locations. These are given in Table VIII.

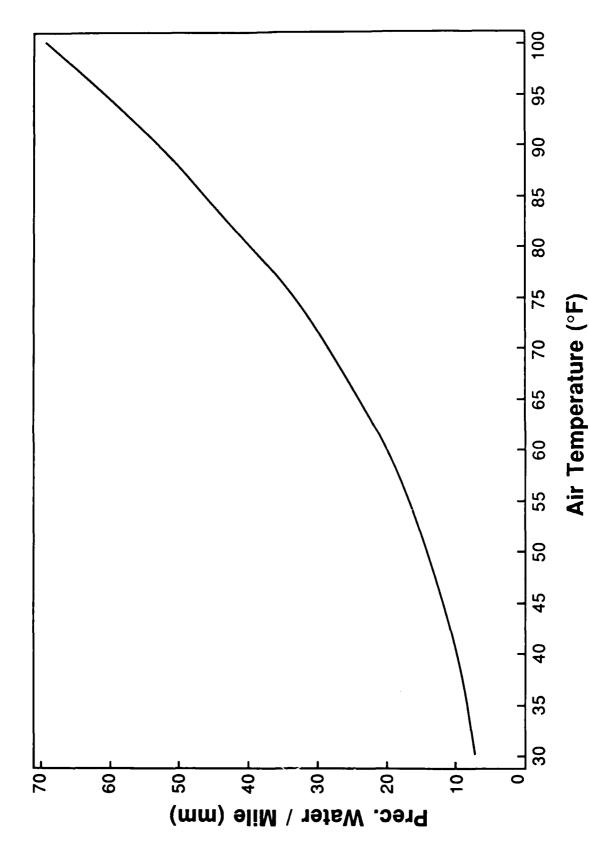


FIGURE 12. Precipitable Water/NM vs Ambient Temperature at 85 Percent Relative Humidity

TABLE VIII
MAXIMUM EXPECTED LARGE SHIP CLASSIFICATION RANGES

Offshore Location (N.Lat,W.Long)	Jan. Mean Temp. (F)	July Mean Temp (F)	Jan. Max. Range (Yd)	July Max. Range (Yd)
East Coast				
44,68	31	55	40,000*	16,700
40,74	37	73	31,600	9,200
35,76	51	81	19,100	7,100
30,81	62	82	13,100	6,900
25,80	72	84	9,500	6,500
Gulf of Mexico				
25,90 <u>Caribbean Sea</u>	71	84	9,800	6,500
Car Ibbeail Sea				
20,70	78	83	7,800	6,700
15,65	79	83	7,600	6,700
West Coast				
34,119	56	65	16,100	11,900
40,125	51	57	19,100	15,600
45,125	47	60	22,000	14,000
49,126	43	56	25,400	16,100

^{*} Calculations are for a flat earth. This range would place the ship over the horizon.

From the projection data given in Table VIII we conclude that the requirement for a 10 mile detection of large ships will be met only for the winter half of the year at latitudes above 40° .

If the requirement is relaxed to a range of 5 nmi for detection, we predict that this will be possible year around for latitudes above 40° on the Atlantic Coast and 30° on the Pacific Coast.

Concerning resolution capability of the equipment—if we equate Johnson's "Recognition" requirement given in Section 5.2 with the resolution required for classifying ships as to type, his criterion would be met for ships having mean vertical subtenses (freeboard plus cargo or superstructure) of 26 yd at a range of 20,000 yd. Assuming that typical vertical subtenses for larger ships vary from 6 to 40 yd, meeting his criterion would require a viewer resolution of at least four times the present value. If we assume in our case that the crew can use the additional criteria of apparent ship length and strength of radar signal return for classifying ships, it would still be wise to select equipment having a vertical resolution two or three times that of the present equipment. One possibility for achieving this is to add an IR telescope (e.g., the "2X Extender").

Concerning the utility of FLIR observation in fogs--it is difficult to draw conclusions from the data of Table VII, since the information from which this was drawn did not give the density of fog occurring at the exact observation time. However, it is known that far IR transmission through nascent (small particle) fogs is superior to the transmission of visible light. This is borne out from a statement in the account of Appendix A, 6 March--0500 hrs, "Turned on FLIR to see how well it would work in light fog or haze that was showing along the shore. FLIR worked extremely well in this case. The Verrazzano Bridge was

hidden in fog except for the very top of the bridge towers. The FLIR showed all detail including vehicular traffic. Distance was about 4 miles. I requested the lookout on the Big Eye scope to describe various contacts for me so I could compare visual observations to FLIR. For the most part the FLIR 'saw' the same thing as the Big Eye except that the FLIR detail wasn't as great because of the difference in magnification. One instance where there was haze the Big Eye could not pick up both a tug and barge and could only identify the pair as a single unit."

7.2 FLIR Range Capabilities for Observation of Details

We will assume that the first degree of resolution of details occurs with the recognition that the ship is a fishing vessel. Unfortunately the number of data points for these is not as large as the number of data points for large vessels. However, one may conclude from the data of Figure 8 that ranges at which ships can be classified as fishing vessels under low and high humidity conditions vary from about 7000 yd at low humidities to 4500 yd at high humidities. Thus we can predict only two nmi range for classifying ships as fishing vessels under all conditions.

The data from Table V.b show that, at least for a stabilized mount, the apparent lengths of ships can be measured to within a few percent by using the viewer reticle and the range given by the ship's radar. Correcting this apparent length for the target angle should give the ship's length or its beam width to within (est.) 25 percent.

The second degree of resolution might be that the operator can sense the presence and motion of men on deck. The data from Table V.A, obtained from shore-based observations, show that the maximum range for sensing men on deck is about one nmi. At such ranges, the sensing of detail is primarily limited by the instrument's resolution. Thus this range should be nearly independent of ambient humidity.

7.3 Utility of the NVS-500 Night Sight and the "2X-EXTENDER"

As has been indicated, the present NVS-500 Night Sight is of very little utility--solely for inspection of unlighted targets.

Conclusions cannot be drawn about the use of the "2X-Extender" magnifier, since it could not be used easily on an unstabilized mount.

7.4 Stabilization Requirements

Judging by the image motion present in the video tape recordings made on the DECISIVE cruise, manual stabilization is suitable only for weather in which the ship roll and pitch is less than 5 degrees.

If an inertially stabilized mount is used, it would appear that stabilization to within 1.0 mrad rms is adequate for eye viewing of the monitor. If automatic target detection (electronic search) is to be employed, the stabilization error should not be over 0.2 mrad rms.

8.0 GENERAL RECOMMENDATIONS

It would be possible to use the equipment in northern waters with reduced operating ranges. However, before the severe operating limitations indicated in this report are accepted, it is recommended that the following studies be performed:

- 1. Ascertain the improvement in range which can be achieved by use of wavelength selecting filters or by operating at another infrared wavelength.
- 2. If the results of study 1) are favorable, study possibilities of increasing instrument resolution, so that details of actions on deck can be perceived at ranges greater than 2,000 yd.
- 3. Study the requirements and cost of a stabilized mount.

- 4. Study means of automated search and detection
- 5. If the results of Studies 1.) through 3.) lead to an instrument producing a stable image with a good image signal to background noise ratio, study the possibilities of computer image enhancement.

A search should be made for visible light intensifier apparatus having less severe glare problems than does the NVS-500.

9.0 OPERATOR REPORTS

Reports from the captain and crew of the VIGOROUS and the captain of the DECISIVE are included as Appendix E. Generally comments given in the reports have been included in the previous text.

10.0 REFERENCES AND BIBLIOGRAPHY

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APPENDIX A

REPORT OF FLIR OPERATION ON THE TRANSIT OF THE VIGOROUS FROM GROTON TO MIAMI

--Abstracted from Narrative Account composed by Bob Stachon--

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5 March----2000 hrs. Ens Dietrick conducted the briefing and explained what would be required of watch standers and look outs. It was decided to man the FLIR from 30 minutes after sundown to 30 minutes before sunrise. FLIR may also be used during times of low visibility at the OOD's discretion. Extra lookouts will be used for the FLIR; these personnel will be petty officers who normally don't stand watch. They will stand one 2 hour watch on a rotating basis. There will be 9 PO's for this purpose.

2100 hrs. demonstrated FLIR to lookouts and had a question and answer period. Shut down operations for the night. FLIR watch will start tomorrow night.

6 March 0500 hrs. Turned on FLIR to see how well it would work in light fog or haze that was showing along the shore. FLIR worked extremely well in this case. The Verrazzano Bridge was hidden in fog except for the very top of the bridge towers. The FLIR showed all detail including vehicular traffic. Distance was about 4 miles. I requested the lookout on the BIG EYE scope to describe various contacts for me so I could compare visual observations to FLIR. For the most part the FLIR "saw" the same thing as the BIG EYE except that the FLIR detail wasn't as great because of the difference in magnification. One instance where there was haze the BIG EYE could not pick up both a tug and barge and could only identify the pair as a single unit. Spent most of rest of day demonstrating FLIR to various crew members.

1830 hrs. (approx 38-25 N;74-18 W) Start of first FLIR watch. Again went over the adjustments to the FLIR and also the search/scan procedure that Ens. Dietrick and I worked out. The very first lookout picked up a freighter on the horizon before the BIG EYE. This started a competition between the FLIR and BIG EYE. Worked with the first three lookouts and found them all interested and very willing to stand this extra watch.

7 March 0600 hrs. Everyone including the CO are impressed with FLIR and feel that it will aid in their operations. Adjusted the horizontal and vertical bearing drag and improved the movement of FLIR.

2400 hrs. Weather has been steadily worsening. The ship is rolling and pitching enough to make observations very difficult. I was informed that the FLIR couldn't get a picture. I told them to secure operations for the night and I would work on it in the morning.

8 March 0630 hrs. Did not find anything that could have caused last night's problem. Cleaned the lens and noted that there was a large amount of water spots of the sort you get when you let glasses drip dry. On later discussion it was determined that this was the possible cause. The FLIR will not work when there is a light coating of water on the lens.

1830 hrs. (approx 26-40 N;79-30 W) Continued the FLIR watch. I noted that as we traveled south, the display in the FLIR became more blurred. It appears that as the temperature of the air and water increase, the definition on the FLIR decreases. Objects that were recognized at 15 to 16 miles in colder waters were now first observed at 8 to 10 miles. As we started to approach shore we began to make more and more contacts.

9 March Early morning hours. A contact was made on radar that showed a possible collision course with the ship. The BIG EYE could not identify the contact. FLIR identified a sailboat as the contact and the ship adjusted course to pass safely.

0800 hrs. Arrived in Miami at Dodge Island. Capt Obrien from Group onboard. Demonstrated the FLIR and got good response to the unit.

APPENDIX B

REPORT OF FLIR AND NVS-500 OPERATION ON FIRST TEN DAYS OF DECISIVE CRUISE

-- Abstracted form Narrative Report by Robert Barry--

--Provides additional information for the video tape recordings in the time period 18 May to 28 May, 1987--

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18 May----I held an indoctrination for watch-standers at 2015. Chief Bears QMC and I both covered the FLIR and its usage. The first FLIR watch was set. The sky was partially overcast, stars visible with scattered clouds. The FLIR picked up a passenger liner at 2.4 nmi. Pitch and roll both about + 1 deg.

19 May----0057 DECISIVE ran into rain squalls. Bow pitching down (0 to 2 deg), and rolling (0 to 3 deg) with a 1 1/2 deg list to port.

Lookout spotted a possible flare, and DECISIVE changed course to investigate.

--O227 FLIR picked up a small boat. I had the watch shift to 9X, NFOV (Narrow Field of View). The recorder was started at a range of 0.7 nmi. I examined the contact with the NVS-500, but the anchor light and a light on the starboard side prevented seeing details until the boat was close aboard. At around 0.4 nmi the cabin was observed to be empty. DECISIVE maneuvered to close to 30 y with the boat on our starboard side, lighting it with the starboard searchlight. This was identified visually as the TRUDY MARIE, out of Largo, FL. No one was observed on deck or in the cabin by FLIR, NVS-500, or eye.

--0450 FLIR system had shut down, cause unknown. Energized system and set the time. Upon checking the monitor, I corrected the time. Recording a contact at 2.4 nmi. At a range of 3 nmi it was 3 divisions long. The watch secured at 0510.

--1245 I held an indoctrination to the FLIR for the Quartermasters of the watch and the Boatswain mates of the watch. Inspecting the FLIR, I noticed vibration in the pedestal. Ship speed was 17 knots. The deck of the flying bridge was vibrating, apparently causing the pedestal to vibrate.

--1930 I energized the FLIR system and set time. I tested the FLIR and cleaned the lens. I brought the 2X extender (magnifier) lens up from Combat Information Center and installed it.

--2043 Radar and visual contact at 5.1 nmi.--searching with FLIR. Acquired contact at 3.8 nmi. Using 2X extender, 18X total. Hull aft of the peak tank appeared warm, with the frames clearly visible. The stack and engine compartments showed very well.

- --2056 Interference--could be port winch lowering the inflatable boat.
- --2101 Shifted FLIR to wide field of view (6X). Contact was identified as the M/V CLARIBEL.
- --2106 End of original VCR Tape No. 1.

-- ORIGINAL TAPE NO. 2--

- --2123 I installed a new cassette and resumed recording.
- --2135 Shifted to narrow field of view (18X). Boarding party declared Code 4. Interference for about 80 seconds, could be radio transmission. Had an additional two clicks of interference at 2139. As CLARIBEL rolled, the square after hatch was clearly visible and appeared very warm, like a chimney.
- --2147 Watch stopped recording.

Coast Guard repaired fuel lines to the diesel of CLARIBEL and brought the DECISIVE alongside to rewire and recharge the batteries, securing CLARIBEL to DECISIVE'S starboard side. The Coast Guard tested the cargo, estimated at 346 bales of marijuana, about 15 to 18 tons.

- 20 May--after 0400 M/V CLARIBEL got underway with a prize crew aboard. DECISIVE and CLARIBEL underway for Key West, FL.
- --1330 FLIR energized (without recording) to monitor PT. LOBO, an 85 ft cutter.
- --1500 M/V CLARIBEL was transferred to PT. LOB) for towing. DECISIVE got underway for Key West.
- -- 2000 I energized FLIR system.
- --2009 Lost power. System reenergized and time reset. Radar Contact "A". Ship maneuvering to intercept.
- --2050 Picked up contact on FLIR, NFOV with 2X extender lens. Since Quartermaster could not find FLIR log, no FLIR watch set. Good detail on FLIR. NVS-500 image masked by lights; the outriggers were the dominant feature that was clear.
- --2350 I secured the FLIR system and removed the 2X extender lens (end of use).

- 21 May--1215 Moored at Key West, FL.
- --1700 Underway.
- --2000 I energized the FLIR system. After cleaning the lens, I installed the spray shield. Speed was 17 knots and relative wind about 25 knots.
- --2007 Locked FLIR at 000 deg bearing and recorded pitch; then trained FLIR to 270 deg and recorded roll.
- --2330 Radar contact. DECISIVE changed course to contact. Manned FLIR, but did not record. Wind was gusting to 31 knots, relative. Unable to acquire contact with FLIR.
- 22 May--0015 Rain squall. Contact no longer visible at under 5 nmi.
- --0045 I secured the FLIR at 180 deg bearing.
- --0115 Still in rain squall with the wind gusting to over 36 knots, relative.
- --0200 Wind still over 30 knots. I secured the FLIR system.

--ORIGINAL TAPE NO. 3--

- 22 May--1325 Boarding small coaster, M/V ESJOCI. Two very hot vertical exhaust pipes aft, one port and one starboard, outboard of the access ladder. A third exhaust pipe and muffler on the port side appeared to be unused, and did not show up on the FLIR. Crew of eight gathered on the fantail. Very easy to distinguish between the crew and the boarding party. Boarding party found a false deck in the forward hold with 18 Haitians hiding under it. They had to tear up the decking to get them to come out. Too many and too close together to count with the FLIR.
- --1500 Coast Guard crew pumping bilges on M/V Esjoci. Reddish discharge, clearly visible on FLIR.
- --1530 Transferring 4 x 4's and tools to M/V Esjoci.
- Second contact, M/V Paulina Express. Monitored through FLIR, but not recorded.
- --2100 Escorting M/V Esjoci to Miami, FL. Monitoring with FLIR. M/V Esjoci is supposed to be on Decisive's port beam; however, she keeps drawing ahead and moving further south of track, toward

- Cuban waters. M/V Esjoci's master requested course--may be having compass problems. Coast Guard Officer of the Deck told him to steer course 300°.
- --2320 M/V Esjoci dropping astern.
- --2323--Recording FLIR images; anchor cable visible. Esjoci's master claims to have run aground.
- --2334 Bearing to M/V Esjoci about 3150.
- --2344 Bearing shifted to about 175°. FLIR looking between the expanded metal shield and the mast.
- May 23--0004 Shifted to NFOV, 9X. The expanded metal shield and halyards are visible in the foreground while monitoring Esjoci.
- --0025 End of original Tape 3.
- --ORIGINAL TAPE NO. 4--
- --2000 Energized FLIR, cleaned lens and set time.
- 24 May--0100 M/V Esjoci DIW. Repairs carried out.
- 0346--Recording Tape 4. Contact appears to be a freighter with a barge on its port side. Bearing about 320° at start decreasing to 290° .
- 0349--M/V Esjoci bearing 340° drifts to 315°.
- --0420 The cold muffler, outboard side aft, is clearly visible at a target angle of 350° or greater. The inboard muffler is also visible, but at target angles of 340° of greater. The starboard muffler is highly visible at target angles greater than 010° .
- --0435 Original Tape 4 ended.
- --1945 Energized FLIR, monitoring 41 ft Coast Guard boat approaching Decisive. Refueling 41 ft boat alongside to port. INS agent aboard. Decisive's whale-boat used to transfer personnel to M/V Esjoci. Haitians transferred to fantail of Decisive.
- 25 May--0100 Decisive underway for Haiti and Puerto Rico. Due to watch on the fantail, no FLIR wat ' was set.
- --2100 Energized FLIR system, set time, cleaned lens, and tested system.

--ORIGINAL TAPE NO. 5--

- 26 May--0036 Recording a freighter, bearing about 270° for three minutes.
- --0122 Recorded second contact on port side.
- --0307 Recording a freighter at bearing 070°; image on FLIR was very poor. I could just make out the four king posts. The stack and engine room were the only good images.
- --1300 Energized FLIR system at the captain's request, set time, and trained FLIR on sailboat. Good image on FLIR, a man and a woman clearly discernible. The cockpit showed heat, and a boarding party was sent.
- --1400 Boarding party back aboard. Heat was from cooking in galley. This contact was not recorded.
- --2000 I energized FLIR system, set time, and trained FLIR on a second sloop. I watched the boarding party and the sailboat, but this was not recorded.
- 27 May--0112 Recording sailboat on tape. Bearing about 2700; NFOV. Bearing increased to 315° in the twenty minutes that we were recording.
- --0146 FLIR on a second sailboat at a bearing of about 000°, target angle 300°. Recorded for eight minutes.
- --0430 FLIR secured because of ground on 115 VAC bus.
- --1000 Energized FLIR system, set time, trained FLIR on a sailboat. 1.0 division NFOV at acquisition. Boarding team sent to boat. Not recorded.

- --1400 Energized FLIR system. Currently no ground. Secured FLIR.
- --1443 Energized FLIR system, set time, and tracked a small M/V for about eight minutes. Not recorded. Secured FLIR.
- 28 May--0930 Decisive moored at Roosevelt Roads.
- --1200 Isolated ground to the AN/KAS-1 (sensor) power supply. I departed ship.

APPENDIX C FLIR LOGS

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Time (1977) (6.000 martin) Trop (1970) (1970	USCGC VIGOROUS-FLIR ACTION LOG	Target Ht. Target Wdt. Target Ship Type Ship/Crew Actions How Was Target Found? (Observer ; Pocor) (2) (2001) (2) (2002) (2) (2) (2) (2) (2) (2) (2) (2) (2) (270 TANKER NESSEL AND GOOD OUT LINE OF THE TIME OF	A THE BOLD OF THE UNGGOOD.	SELVACED THE RECENSE OF LIGHT	100 100 Che - Ches	5 14 190 Weden By Eyk & Blo KHES - GOD INNERS April Plice.	1000	Also all 2 tear buys hikeo up or thation	2 // / / / Comment of the farmer - 100	15 5 MAD the but dis- Good Makille on the	مكر حراسه م		3 090 VIBILAIT 6 TO	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	MESSIC TYPE	The Maria of the State of Marian		The man Share said of all south me	CAR MILLIMON SHARMER (CCAR) "NO PAIL INFORMATION OF SHALL OF AND	7 10 120 miles planse-squir inhered the Linese	1. S / S / S / S / S / S / S / S / S / S	
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	Ship/Crew Actions How Was Target Found? Recorder Other Observations	PREMIULY FUR GING VET VACE IN AND		What By Cres	Add St Orage I may	196.90	N/M SIGHT/MADAR SPC	NONE DOTON HOLISSON	505	ない	W 11 11 9.42	Hull Kigeling		Acimal U/W has close Ref Dr	Sport toos CLOR Insec	7	POTITIVE BASE.		Flo State Transles. Vison. 1.D 124	
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<u>-</u> >	Date	Time	Longitude Latitude	Latitude	Maximun Plech (xx) ; Roll (xx) Angle	Target Bearing	Radar Range (y)	Radar Signal Strength	Target Ht. ret urbs (xxx.x) ; y (xxx)	Target Wdt. ret. unite (ma.x) .y (mx)	Target Angle	Ship Type	Ship/Crew Actions	NOTES: How Was Target Found? Other Observations	Observer ; Recorder
154	18-6-h	4122	1.899	1514	9/5	300	058'h	STR	۶.	لأ	180	F/u 5	STERROS TRAMI	ורבאט ומעפר)	A 1
991	4-9-87	2214	2		8/0	313	8/8	Š	ŧ,	ن	300	70 8	SHEEKIN TRACLIC	4,	3
۱٦/	48-6-6	122	-	=	%	ታታየ	583	\$	Ę.	Ņ	3,0	F/V S	STETTED TRAME	=	9
291	44.67	22.29	8577	Š	%	067	40%	Sign	ÿ	1.5	270	CANAS	CAMADINA RESENACH VESSEL	WESO.	Ž.
163	18-6-h	1251	6706	4155	%	337	3,450	STR	بما	1.57	170	110	STEKEN TRAMIL	We ceem made	¥
791	4-8-87	12251	6700	4 88	Ş	325	8.5	Ĕ	'n		200	F/u	Stoken Ter	TEAL CUTTON INACE	The state of the s
597	4-10 g7	6034	\$318.5	9'\S)\	,	340	i n							or The Heriz	BZH
3974	-	0380	27.57 KE	\$ X	8	9	Ŝ	K		M	260	1	West Charles	これ からかい	(F)
(9/)	1/14/87	0350	67-57	87-14	%	060	14,400	Syk	8cip	6/18	√.	F/O?	1/2°	GARCE BLIP OF	
7	14 forth	3405	\$ 0.85 \$	Ş	*	1	1	4		•^	13	ķ	Act to	dear Aubile	
<i>89)</i>	to on the	345	62-03	14.14	73	080	6800	X	μ	`	30	F	11- Falone	Com, last Scent	Q
169	Well	Soso	41-16	が	<u>_</u>	3	1	¥		*	38	Z.		THE STATE OF THE S	B
170	18/01/2	0545	LE	12	2	340	dao	ST	`	ч	280	1/4	A.France?	New month on	N N
171	4(10,61	8			**************************************	l	8	K	•	7	8	7	STREW TRAVER	PLAN , REGIST THE TO	R
2,7	W10/87					338			ď	, U	۸.	3	FRANCE	PROFILE	the contract
173	work					X	8	É	ď	ď	.B.	, UM	TRUKER	Count Metrices	grc
174	1/10/27	38.96				8	See DA	ر الم	d	1.5	8	1 04	¥	PLOT HOUSE,	OFC
175	13/01/5	2000				CA	3	¥	\$:	ιęΩ	gre	2		CAN CREATE PRESIDE, SOMERSTRUCKURE	S. S.
٦	13/C1/15 9/1	8913				315	2	STR	O	ر د	8	Flu	LEISHING PROMISE		<u>x</u>

27.							SCGC	VIGO	USCGC VIGOROUS-FLIR ACTION LOG	LIR AC	TION	100			
AK.	Date	Time	Longitude Latitude	Latitude	Medinur Flich (xx) : Roll (xx) Angle	Target Bearing	Pader (c)	Rader Signet	Target Ht. Target Wdt.	et Ht. Target Wdt. b (xxxx) ret. orbs (xxxx) cot) y (xcx)	Target Angle	Ship Type	Ship/Crew Actions	NOTES: How Was Target Found? Other Observations	Observer ; Recorder
1.4	csfult	60.00	Cish	27.45	do	330	3	SK	Ň	1.25	.071	1, isy	UNK	N.	6.00 Fee.
7:	447	8:35	4221	Z Z	90	920	ļ	S.	-	×	110	7	Authorn Calmbie	MIKH BETTER DEL	حر
174	>	5 × 5	LZZh	2002	ن اهر	320	12,600	7		5	270	Flv	~~~	Broke Frie	
ે8 †		4/6/2>	97.73	ER	2	235	3	4	~)	•	750	r F	423	Rusher	X
18/	715919/11/4		27 74	7	o/a	350	000	ト	با	7 ;	240	斤ん	アグラ	PLAST TO HEAVE	X
ا &ر	7 K	A			9	9	2	2	Š	\$	<u> </u>				3 .
183	415	SIOZ			90	240	530087	25	~	ٔ ڡ	040	٠, ۲	3	100404	25
187	<u> </u>	5102			8	130	B	H.	10	*•	270	3	<i>?/</i> 'n	in Koul	272
· \$ >	21/4,	\$			200	100	G 100	1-5	1.	7.7	270	řλ	4/10	BAURZ	277
c-	4/11	20frS			80	91	3	¥	*	-	012	3		PAPAR	22
±€ 16	۳ <u>/</u> ۲	200			8	160	03/21	72	1.7	48	97	-tighrer	M		272
- - -	H) !!	2115			90	33	23	Ľ	J	6	260	FREMER	3	=	24
187	ر بر/ج	9717			%	010	955	TED T	ᇯ	۲,	8	TY.	4.2.Y	14%/ 15%/	27.
<u>ァ</u>	4/11	2140		T	R	.2	8	Š	_	۲,	¥3	₹ ₹	EST		200
88	11/6	21.55			2,	3%	00191	ME)	2.	٠.	X Z X	7 2	Z Z Z		SA
189	ار ال المارية	1165			2		Ş	, "			920	<u>Z</u>	* HEW G	SEE SINCE IN MERINA	2012
061	7	1955	エニュ	56789	200	350	2002	70	×	28	270	270 GENTER	S (Esterioris	PASAE/U.S	<u>字</u>
Ŧ	C. S.C.	Fue south	2	THOSE	*	3	î	<u> </u>	200	76	LIGHT FOR		CHEMICS LAND	DOUBLE OF	Pur was,
	ere Ere	Pacheine	PREGUENT LAPUNE	र 3 —	4	- 3	possion chances		מפכיו.	A ZAREJ U	<u>څ</u>	०० वस	LR. ATTEMPT	ELECT. HAZARD WITH WITHER ON ALIR. ATTEMPTED SIGHTIMES # 1	作品,四十

The want					ار	שטפר	75.	りつつよ	USCAC VIGOROUS-FLIR ACTION LOG		2			
Date	Time	Longitude Latitude	**************	Maximun Plech (m) Roll (m) Angle	Target Bearing	Radar Range (y)	Radar Signal Strength	Target Ht. ret. units (xxx.x) : y (xxx)	Target Ht. Target Wdt. ret units (xxxx) net units (xxxx) : y (xxx)	Target	Ship Type	Ship/Crew Actions	NOTES: How Was Target Found? Other Observations	Observer Recorder
11 FOL	WITH 2010	52 55 74 94 6	517 24 96	1/1	270	2.2	72			CPK	ONK ONK	חאכרנאטר	Raday	*
		8.		***								1001		-
		en de Ber	21 21 8.33			**************************************	***					- میم		
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										941 8				
										*			:	
											#8.475 21 21 21			
J. J	MOTE: Bootel links - Been fronts													

2 Knos:		Letitude	Time Latitude Longitude	Pach (cc) Fool (cc) Angle	Target	1 2 3 3 3 3 3 3 3 3 3 3	Signal 7	of cost	Target Ht. Target Wdt. ret. units (xxx.x) ret. units (xxx.x) yd (xxx.) yd (xxx.x)	Target Angle	Ship Type	Ship Details Seen Acrew Actions	NOTES: How Was Target Found? Other Observations	Observer : Recorder
8 1/3 (1)	₹ §	10,92 5107	45,55	1°x2°	0/5'8		+ -	2.5	4	300	Profile	STACK,	2025R INITINE	BARRY
N ()	3	For	Sartice Con	4 82	· WASH			DW.	1 8	NOK Y	11A 6516	EYES. DETA	MOROR YIM BIGEYES. DETAILS ON THOSE	Cones
(1)	223	A223 25°53 83°49	83.49	3°×2	2,081	6720	Sricovie				JSC682		RADAR	9
*	2647	180.22	2447 22°0811077°18'	3. X 2°	OHS'R	A A A A A A A A A A A A A A A A A A A	S ROME /			970	HYDROFOLL	S FAINT SIL	030 HINDER AND SILVER LAND SIL	4780
	Ş				1	3	\$	S SON	Same Man	SHE W	ONE Y	S. LIGHTS V	ONEY USE LIGHTS VSIGEE, AT NOROX JUM	tox 3N
2/20	0 02/	Jan View	WAS	DISTINC	J . D	BPARDANG		30.7 TED	ABONTED (HYDNOFOIL HER	201		IDENTIFIED A	ENTIFIED A USS HERCULES KO	75 C
WERE	V	A INE	NISING	-8-	350/27 ANDARD		GOUIDMENT		AT CPA	A T		1.7 NM (SHIPS BIDOCLLIMES)		Ken
الداا	٠, ١	VISUAL	CONTA	CT AI	SNM	Arphox 1	10000	HR LATER		AT AT	NITERCEPT	170,027		7
8 F.	>	, L	DISTINCT	AT 3N	. WN	AT I	> 2 2	VSL DETAILS	TAILS	VERE	VERY C	VERY CLEAR AS WELL	AS CREW ONDECK !	Khine
	F.	וועצבו	MP. C	n Fell	Ju.	4	76.01	310	7	N.C.C.	SHawep	٦ <u></u>	7 . 7 . A. A. B.	100
Jun S	1700	75° gr	87.33) JEX .	4.01.0	3,000	HEDOL).20 OFO	040	05.1		TOT ACQURED OR SUPPLY	Sen
12Jun 9	00.00	10 40 26.12 83°34	reas	2 0/X0/	040 3	3,600 5MAL	MACL.	1	;	040	7/3		DUTLINE VISION OF 10'D BY	9

APPENDIX D WEATHER LOGS AND PRECIPITABLE WATER VALUES

PAGE
CGC VIGOROUSD-3
CGC DECISIVED-47

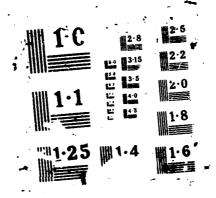
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TR. U.	PARTMEN ANSPORT S. COAST -4380B (Re	GUAR		7	LO	G - WEA	THER OB	SERVAT	IOH A	ND	OP ER/	ATIONA	L SUN	MARY	SHE	ET		
	EL STRIFF							DAY		7	DATE		ZONE	DESTINA	TION			
U	SCGنے	Vic	HORDU	5 1	NME	62	7	FR	DAY		e Ma	R 87	+	5 R	m	12C		
							I. WEATH	ER OBSE)NS								
			ESTI	INDS IF Mated				1	RATURE room)		CL O	U D \$	SEA		A WA	Y E S	SWELL	WAVES
TIME	MILES	TEM THS	DIRECT- ION (True)	(Kno(s)	VISI- UILITY (Miles)	Symbole)	1	DRY	WEI	- 1	AMOUNT	TYPE	TEM	. 101	•	HEIGHT (Feet)	DIRECT-	nticht (Foot)
01	LCi	5	280	5-	 	UR	30.48	3.7	300		Tentha)		30	- 1		1	(True)	===
0.2	10	4	280	5	10		3049	36	32	+	(D)		- 30	ع ح	-			
03	10	4	280	5	10	CLR	300 49	36	31	十	0		+		- - - (2)	1	_	_
04	10	2	280	5	10	7	30.48	35	33		0	_	-	ZS		1	_	_
05	11	12	270	6	10	CLR		35	33		Ø		 -		30	<u> </u>		_
06	13	5	280	5	10	CLR	30.49	35	3		0		30		_	\overline{I}		
07	10	1	280	4	7	CLE	30,50	35	3 2	-	Φ		-			 -		
08	19	0	280	4	8	CLR	3049	36	7 3	_	0		+-	_	15	1		
09	Moc					<u> </u>	JUNI	1 34	ر د ا	+	<u> </u>			- -				
10	117		f			ļ		 	 	+			1		\dashv			
11	9	4	280	5	(\$	Scr	34.46	42	37	7	01	Cı		- 17	0	1		_
12	14	5	210	10	10	SeT	30,44	41	37	\Box	2/	ر ب	34	179	2	1		
13	14	7	210	12	Low	SCT	30.43	40	37		01	دی		170	م	1	_	
14	15	3	230	21	10	SCT	30,40	40	38	4	01	<u> </u>		120	α	2	_	
15	15	4	230	18	700	SCT	30,40	41	38		02	<u>در</u>		21	0	2	=	
16	15	7	250	20	10	हरू .	30.38	42	38	_	23	<u> </u>	39		_	2	220	
17	15	5	263	17	10	ScT	30.38	42	38	_	03	<u>C:</u>		22	_	1	240	12
18	16	ليا	236	18	1c	SCT	30.37	42	38	_+	03	<u> </u>		22			740	2
19	16	5	246	24	10	SCT	30.36	42	39	→-	03	<u>ci</u>	=	22	0	1	240	2
20	15	2	248	22	10	SCT	30.37	43	40		01	Ci	38	Z2	Ø	(240	2
21	15	Z	250	24	(p	Sco	30.39	43	40	_	<u>8</u> (<u>ci</u>	$\perp =$	- 22	Ø	_(744	(
22	16	1	257	(6	145	CLR	30.40	44	41	4	Ø			22	0		244	1
2.3	16	3	239	15	10	CLR	30.38	45	41		0			·ZZ	0	1	240	1
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	<u> </u>						11. OPERA	TIONAL S	UMMAR	Υ								
		 -	s	TATUS AT	9001					CHECK LI	ST			TIM	E	INITE	AL S	
_	IAL CONO			YOKE	=		1. Н	eld quo	aters	5.			12	, Z	~	PAL		
READII	HESS CON	DITION		W	·			2. C	hronom	eter(s) wour	ıd.		111	35	1	PAL	5
	TIONAL S	TATUS		ALP	HA			3. H	eid eve	ning	reports	<u>-</u>			94		OR	<u> </u>
HISSIG) N			JE				4. M	agazine	s in	spected	i.			0 3	0	Be	F
	 -	 -						4a. 1	Jaximu	m te	mperatu	19: (A°P	4b.	Mini	mum te	mperatu 7°F	re:
MACHI	ERY CON	TION	AND DISC	REPANCIES								DRILLS	AND TR	INING			<u> </u>	
IAU	JN	1AC+	1 INER	Y 1	06,5			Be	gan .	E	inded			Тур	•			
								123	0	1	300	Aran	Dowl '	Snie .				
£1 £474	OH 6 /66"		*14m -44***							1								
ereş i			TION CON	BITION AN	DISCREP	ANCIES		-	• `	₽-		1						
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Sym A : 1	0/0	122		84	#\$ET. -	158	7	→ D-3	³ ′	luth.	Attaci	hed L	eave	TAD	 °	ther	On- B	loard

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3.67) VESSEL 'S345450-ZONE DESTINATION DATE VIGOROUS WMEC 677 USCG 7 mm 87 +5 ROMEC SATURPAY 1. WEATHER OBSERVATIONS TINDS IF TEMPERATURE. ESTIMATED CLOUDS SEA SEA WAVES (Degrees) SWELL WAVES DIRECT-TIME MILES DIRECT FORCE *151-WEATHER BARDMETER WATER DIRECT-HE I GHT (Feet) HE ENT ION BILLTY (Symbole) (Inches) DRY WEI AMOUNT TYPE TEMP. ION 104 (Knots) (True) (Miles) BUL B SEA LEVEL BUL B Tentha 3039 \bigcirc 0 1 16 250 42 250 14W 0.2 41 15 4 CLR 30038 Ø 250 140 2 250 10 0.3 9 ❿ 250 UR 3036 44 14 D 10 <u>250</u> 0 4 16 246 30.35 47 42 **25**Ø 1.50 2 0 B cur 05 16 3a37 _ 150 250 Ø CLR 45 42 250 <u> Sez</u> 06 16 343 40 170 07 43 15 6 محت 3**0**.36 47 140 2 000 $T \mathcal{Q}$ 08 016 8 10 ScT 30.37 59 <u>5 ø</u> 01 CU 140 2 15 9 Sur 400 68 3 09 دں 038 10 (4 34.35 50 10 2 13 Set <u></u> 046 12 (0) 34.32 60 04 7Ø 120 14 ScT 59 040 30.32 04 ں ح Q36 11.5 lФ 68 70 3 100 3 12 9 i2.5 30.ZB 6 04 CJ 105 120 1 d SCT 13 کِ 30,26 15 3 145 ΙØ BKN ں ک 145 11. 25 54 125 14 0 1150 12 10 BKN 30,22 67 68 150 15 <u>58</u> 59 3022 13 10 <u>ر</u> ۲ 68 150 150 67 30 2 14 BKN 060 13 2 2 BKN 30.20 47 100 090 16 12 ھد 67 17 145 ia OUL 13 30/17 (a) 190 2 120 18 14 30, (6 110 2 හ TO 000 ھا 10 Q_{u} 110 Z 104 5عا 18 67 Se_T ١3 1089 40 80.15 110 120 18 40 ۲ما Ci A KN 34 70 11 107 CU 70 10 100 (20 2 **(** 30,10 67 60 30 21 12 129 OVC 62 ي ح 70 5 10 10 100 13×5 6 (3 ත 145 35 62 22 30,05 68 $C_{\mathbf{u}}$ 70 5 5 OVC (0 (0 low 2/1 23 12 **BYC** 30.02 69 100 5 103 10 lα 70 34 2999 7മ 47 101 11. OPERATIONAL SUMMARY STATUS AT DOD! CHECK LIST TIME INITIALS MATERIAL CONDITION YOKE 1225 PAW 1. Held quarters. READINESS CONDITION 1134 SKC īΖ 2. Chronometer(s) wound. OPERATIONAL STATUS 4LPHA 1945 9KC 3. Held evening reports. MOIZZIM 4. Magazines inspected. **4835** QRC. 4b. Minimum temperature: 4a. Maximum temperature: 65° 32° MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING MACHINBRY Ended Began Туре LOG 5 1235 1250 HOAT STRESS LECQUEE ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES "WEAX FAX Auth. Attached Legve TAD Other On Board D-4SUNSET. 1806 SUMMISE 0624

	TRA	PARTMEN NSPORT 6. COAST	ATION GUARE			LO	G - WEA	THER OBS	ERVAT	INA HOI	OPER	ATIONA	_ SUMM/	ARY SHE	ET		
		4380B (Re							DAY	, 	DATE		ZONE DE	STINATION			
	US	SCG د	Vic	-okar	5 (L	dn 5	c - 60	27)_	اجا	بهرد.	8 WA	ر 2 ع	1+5	Roin	60		
								1. WEATH	ER OBSE	RVATION	s			·			
					INDS IF	T				ERATURE		000\$	SEA	SEA WA	v F 9	SWELL	#4vf C
J	TIME	MILES	3	DIRECT-	HATED T FORCE	V151-	DEATHER	BAROMETER		grees)		1	WATER	DIRECT.		DIRECT-	T =
Į			1 2	IDN (True)	(Knots)		(Symbole)	1	DAY	WET BULB	AMOUNT Tentha	TYPE	TEMP.	(True)	HE I GH T	(True)	Feet)
ŀ	01	13	0	125	35	40	OUC	2946	70	65	W	NS	68	130	7	190	5
Ì	0.7	13	Ø	12.0	31	100	OUC	2994	70	66	La	NS		130	8	MO	5
1	DJ	13	17	120	1	10	OUC	2992	70	66	9	دن	68	130	8	190	5
Ì	04	12	9	134	33	LO	OVC	29.89	71	67	10	Cu	71	140	5	140	7
ı	05	12	9	137	37	10	SiT	29.85	71	32	4	Cu	70	140	5	160	7
ł	06	15	0	125	36	40	OKN	29.85	71	69	8	Cu	71	140	4	160	0
Ì	07	15	a	160	33	+0	13K M	29.85	77	70	7	Cu	71	150	4	160	7
ı	G B	15	8	185	25	10	BKN	29.88	75	70	7	Cu	74	170	4	100	5
t	09	15	8	200	25	10	OVC	29.89	75	70	10	Cu	70	170	3	100	6
أيد	10	15	8	240	24	10	OVE.	29.90	74	69	03	Cu	70	230	3	170	6
7	11	15	9	220	21	10	Sct	29.92	76	(48	04	Cu	70	234	3	170	4
ı	12	14	6	220	20	100	BKN	29.90	76	68	6	(0	68	2300	3	080	4
ı	13	15	7	2.3(1)	20	10	SCT	29.87	76	68	4	رن	69	230	3	osa	3
Ì	14	16	5	235	20	100	SCT	24,84	75	68	3	cu	72	230	3	180	3
t	15	15	0	220		10	CIT	29.84	75	67	3	20	71	230	3	180	3
t	15	15	2	218	25	JO	BKN	29,82	74	69	7	Cu	71	190	2	210	3
ı	17	14	9	259	30	10	DIEN	29.82	76	69	17	ai	70	200	2_	220	3
ı	18	13	6	250	24	10	ScT	29.85	75	68	3	Cu	71	230	2	530	2
ı	19	13	4	252	18.5	100	BKW	29.86	75	66	6	Cu	70	230	2	230	2_
Ì	20	13	3	250	(8	10	BAN	29.88	75	67	6	Cu	70	240	Z	240	Z
Ī	21	12	4	260	30	(0	Sct	29.89	74	65	4	Cu	74	240	1	240	2
ſ	22	12	7	263	27	10	ScT	29.90	73	67	Φl	Cu	70	250	1	250	2
Ī	23	13	7	280	15	10	ScT	29.92	70	65	01	Cu	74	220	l	l	
	24	7	9	276	10	100	LLR	2992	69	165	3		72	220		_	
T	101	337	i		·												
ſ								11. OPERA	TIONAL	SUMMARY							
ľ					STATUS AT	0001			\Box		CHECK L	IST,		111	d E	INIT	1465
	MATER	IAL COND	TION		YOK	E			1.	Held quar	ters.			123	? 5	PAS	
		NESS CON			TIV.				2.	Chronome	ter(s) wou	und.		1100		PAC	
L.		TIONAL S	TATUS		ALP	чΑ			3.	Held even	ing repor	ts.		194		90	
	M (3 S (ON			UE				4.	Magazines	inspecte	ed.		08	18	9	<u> 2</u>
-									40.	Maximum	tempera	ture:	30°F	4b. Min	imum l	emperati	T _F
T	MACH	MERY COM	DITION	AMB DIS	CREP ANCIE	\$			T			DRILLS	AND TRAIS	1186			
r	AL	s n	ACH	INE	24	406	<u>.</u>		В	egan .	Ended			Туре			
]							
L	ELEÇI	ROH! C/CO	AND THE C	ATION CO	NOITION A	O BISCRE	PANCIES										
							-		\perp]							
L																	
Ĺ																	
L									_ n	-5 ^	uth. Atta	iched L	.eave	TAD	Other	One I	Board
L	tun n	" 00	129			WHSE T	822					i_					

DEPARTMENT OF TRANSPORTATION LOG. WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINATE OF STAC VESSEL BARREN 4 MAR 87 H 5 ROMEC VIGOROUS WARE -627 Mayon USCGC 1. WEATHER OBSERVATIONS WINDS IF TEMPERATURE cuaues SEA BAVES DETAMITED (Degrees) SEA SWELL WAVES ž WATER DIRECT. TRECT-FORCE WEATHER 4121 -BAROMETER T 1 M F MILES DIBERT. . . 15.0 TEMP. ION ION BILITY (Symbole) (Inches) nev ... AMOUN! 101 (Knots) = = = (True) (Miles) SEA LEVEL BUL B 8171.8 Tenthe True True Dearess 2942 64 230/1 9 68 70 230 10 CLR 10 0 1 7 0 230 0: 14 65 230 7 2440 0 LO CLR 68 ci 0.3 69 230 3 2300 2990 65 7 HD SLT ت3 0.4 CLR 68 9 29.96 10 5 241 ΙØ රින 0.5 <u>ا</u> 210 Ø ÓĮ 79.89 70 263 TO (C 06 8 2(6 _ BKA 79.90 70 صاحا 318 $\tau \infty$ _ 69 LIS BKN 07 29.92 71 67 Jc Ø 8 6 7464 67 56 69 0.8 9 210 BKN 29.92 71 09 MOORED 10 11 29.92 62 cu 10 72 12 120 BKN MOUREN 03 13 14 15 Ø7 68 BKN 300 2984 ح 16 MODERIED) 17 18 19 CUR 29.84 65 240 15 Ó 20 Mount 20 MOGRED 22 23 **63** 68 240 05 W 29.86 3 SUT 24 Moores to t 11. OPERATIONAL SUMMARY INITIALS STATUS AT 0001 TIME CHECK LIST MATERIAL CONDITION B214 1225 YOKE 1. Held quarters. READINESS CONDITION 2. Chronometer(s) wound. \mathbf{II} OPERATIONAL STATUS BIH 1945 ALPHA 3. Held evening reports. MUSSION BZH 1100 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING IAW MACHINERY LORG LOGS Began Ended Type ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES Auth. Attached Legve TAD Other On-Board D-6 SUNRISE OG 36 SUNSET



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TR. U.	PARTMEN ANSPORT S. COAST 4380B (Re	ATION			LO	G - WEA	THER OBS	ERVAT	NA HOI	D OPER	ATION	AL SUM	MARY :	SHEET		
	T 33.44				·			DAY		DATE		ZONE	DESTINA	T'. 3#		
U	scoc L	ITC	n en	1115/	ME	C 63	7	WE	DNESI	7/14 /1/	4AR 9	17 +	5 Rc	MEO		
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ŀ	ł	1 5	(True)	(Knots)	(Miles)	(Symbole)	(Inches)	DRY Bul B	TET .	AMOUN!	TYPE	TEMP			ION	F = 6H
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							11. OPERAT	IONAL S	UMMARY							
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TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U.S. COAST GUARD CG-4380B (Rev 3-67) VESSEL SHATTUR ZONE DESTINAT OF + 5 Runge 12 MALL 27 USCGC VILLERIUS (WHILL WZ) 1 HUILS DA 1. WEATHER OBSERVATIONS WINDS IF TEMPERATURE ESTIMATED cuauts SEA SEA BAVES (Degrees) SWELL WAVES Ξ DIRECT DIRECT. TIME MILES FORCE ¥151+ WEATHER RATER BAROMETER II RECT. 3 (Feet) š 811.17V ... **8** F T TYPE TEMP. 104 10M Symbole (Inches) AMOUNT ION (Knots) (True) (Miles) SEA LEVEL 8UL 8 8178 Tenthe Degrees, Tour 09 69 090 10 SCT 30,08 04 70 060 D9L 0.2 SCT 30.D8 68 10 240 070 102 03 13 04 CU 10 61 0.3 70 3 04 CU 050 091 30 OS 68 070 SCT 10 61 ۵ 6 4 13 3 ک 050 CA 10 Sct 30.07 68 a z 70 1 M 64 070 05 ø5 60 14 326 Ø1 ci 8 SUT 30.08 61 70 a 54 (4) 070 06 3 3au BCN 68 ٤, 15 05 (0 344.09 61 06 Ac 70 0000 0.7 15 9 4c 70 3 05 BKN 3Ø, Ø9 **47** 310 67 460 (4 6 l 69 0.8 15 316 Ac 10 70 060 BKN 30.11 62 06 320 71 10 5 BKK 64 09 A۷ Ø35 7 100 3012 10 71 40 **Ø3**5 **330** 72 2-66 S 3012 10 OUC 11 3 8 72 66 33*0*0 10 7/ TO 3012 0Z0 OUC 41 5 CI 12 324 5 73 65 010 5 30.09 71 14 0 VC (a 3 294 13 2 o vc 30.07 72 64 lai Cι 7(060 id 14 3 64 9 5 5 280 10 72 ىب 71 10 BKN 30,05 610 15 3 65 72 70 350 5 Φ 278 9 (0 30.03 9 **(0** BKN 3 13 **33**0 290 10 30.02 65 کن 010 3 BKN 70 17 30.03 Cu**300** 0 780 10 BKN 71 20 18 10 8 Cu 270 BKN 30.O3 63 70 020 270 0 10 280 020 19 280 10 30.03 ove 20 5 20 330 10 **7**10 70 21 3300 63 LO 3004 7 દ 22 8 40 6 8 335 BKN 3300 3**0**004 くい **5**0/00 69 23 9 300 40 3*00*4 6 3 9 CU DLeD 1335 300Z 33*0* 24 10 حب 010 6 70 101 11. OPERATIONAL SUMMARY STATUS AT 0001 CHECK LIST TIME SARITIALS MATERIAL COMBITION BeF 1600 OKE 1. Held quarters. REACINESS COMOITION AW 1126 2. Chronometer(s) wound. W OPERATIONAL STATUS Der CH ALPHA 1945 3. Held evening reports. M12210 Pret LE 4. Magazines inspected. **6**834 4b. Minimum temperature: 4a. Maximum temperature: 767°F **63** MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended Type Began MACMINERY 220 CLECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES Auth. Attached Leave TAD Other On Board D-8SURFISE DG2 SUNSET

DEPARTMENT OF

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINATION DATE VESSEL BARANAM DAY +5 ROMEO 13 Mar 67 tr. DAY USCOC VIGOROUS (WHEC 627) 1. WEATHER OBSERVATIONS TEMPERATURE WINDS IF ESTIMATED CLOUDS SEA WAVES SWELL WAVES (Degrees) SEA WEATHER MATER DIRECT. DIRECT. MILES DIRECT FORCE VISI-BAROMETER IME HEIGHT (Poot) HEI GHT (Feet) AMOUNT TEMP. 100 ION WET ION (Knots) BILITY (Symbole) (Inches) (True) BUL B (Miles) SEA LEVEL 8UL 8 True) (True) Tentha Degrees) ĽΣ 340 2 30.01 71 350 14 000 0 1 JO OVC 65 2 7999 Cu ∞ 91 A 70 340 0.7 Z 348 $\pm \infty$ OVC 10 29,98 350 2 0.3 2 338 19 200 71 64 10 70 340 10 0 4 29,98 71 340 350 357 70 7 16 τ c>SUC **64** (o TO 05 10 BKN 29.99 63 7 Cu 70 012 12 70 5 2 330 5 0.6 70 000 29.99 63 340 ((10 BKN 70 6 4 07 000 5 69 335 (Cυ 9 (4 BKM 30,00 70 63 6 KOOZ 10 00 6 CU33*5* 000 3 6 71 3 Sct 335 10 3a),(1)a) 09 ر ب 7 ナシ SCT 30.001 64 4 70 340 (VD) 350 14 10 64 7 CU 320 5 73 010 8 320 T OD BKN 3000 320 11 75 9 1 000 310 65 CU Z1 4 LO BKN 3001 76 12 330 JE **B**K~<u>~</u> 29.98 8 7(3**4** Ø 35Ø 46 330 13 BK-29.97 70 010 32c 10 ے)ما ما يب 14 75 65 סד 320 ∞ 3 W 0 010 000 320 15 75 کھ 7ι 29.92 340 TO BKN 72 4 164 ප (0) BKN 29.90 75 کی 2 رں 33¢ 3*5*0 15 3,70 29.91 73 8 ىك 330 17 4 175 BKN 65 10 6 71 ŧ arc 22.93 340 18 190 (42) 304 Φ O CUප 29.94 65 70 *1*85 10 0VC 72 10 19 340 7 7/ 20 11 ID 240 65 LO 045 1 035 19,94 70 20 1 21 iw <u>ر</u> 3 2994 7ω 5 OHU) 15 ovc 70 65 IO 0340 045 8 3 2994 22 Ø 2 ovula 700 72 のしけ DICO 65 23 3 2995 20 71 3 W 7 2 2 68 63 (D)(D) 2 0 O IO OH5 OUGR 22 4 62 045 5 020 29.95 ھد 010 74 oc TO T 165 11. OPERATIONAL SUMMARY STATUS AT GOO! CHECK LIST TIME INITIALS 1230 MATERIAL CONDITION BLF OKE 1. Held quarters. READINESS CONDITION RACJ 2. Chronometer(s) wound. W OPERATIONAL STATUS TAW ALPHA 945 3. Held evening reports. HISSION HMIO 950 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 62% MACHINERY COMDITION AND DISCREPANCIES DRILLS AND TRAINING Ended Type Began IAW MACHINERY L 005 (D) 8 1(28 BOAT ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES TAD Other On Board Attached Leave Auth. D-9SUMPLES DE 13 SUNSET 1806

TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD ZONE DESTINATION HESSEL STATION DAY DATE + S Romaic 19 11AX El SATUREDA USCGC VILLEROUS (WITE CILT) 1. WEATHER OBSERVATIONS WINOS IF TEMPERATURE CLOUCS SEA SEA WAVES SWELL WAVES ESTIMATED (Degrees) WATER DIRECT-DIRECTnEI GH I MILES ¥151-WEATHER BAROMETER 3 TIME BILLTY WET AMOUN TEMP. ION ION 104 (Symbole) (Inches) (Knots) (True) (Miles) SEA LEVEL (True) BUL 8 Tenthe. Degree 3 020 RSZ 23 4 OVC/R. 29.94 <u>3 يما</u> 63 12 ∕\'s T 4 150 61 3 1 023 7992 65 10 Nz Q30 CAO 3 26 8 2 OVC 29.91 69 10 N_{5} 010 OVC 63 020 0.3 10 70 010 24 ወወወ Ø24 0 4 Z 25 A ovc/K 129.92 67 <u>6</u>3 10 205 70 8 016 0.5 CU/NS P 04 **1**20 lø 70 29.94 7 23 OVUL 66 61 W4Z 10 Ø 4 70 020 010 ı 06 8 054 26 29.95 (∠€ 2ن Ø (ф حاد GZ a Za 07 044 29.98 $C \cup$ 72 Ø(0) 4 69 63 6 4 15 10 BKN 08 0 CU 025 035 40 70 77 DID 16 SCT 29.97 7 Ÿ L U 70 045 2 09 LD) OI C 300.00 (D)1.05 240 11 10 20 73 2 045 040 10 100 3000 a 20 BKN 7 20 13 045 Z 30001 @20 Z W8 10 BKN **ഗ**3ധ 72 0103 4 74 Cu *35*Ø 12 JO 2999 65 0004 6 Ser Cu 13 29.97 4 72 35Ø co770 TØ 65 LØ 5-7 0101 29.95 14 018 Sci 350 15 0 2 م) مد 15 OrI 9.5 10 SCT 29.95 78 67 4 دں 74 OO O **₫** 3₫ 3 78 **6**300 3 10 29.97 67 (600) 16 020 SCT 6 17 3 ID 67 20 70 OZO. Ø30 **6**30 12 BKN 129.96 76 2 66 8 کن 024 18 3 71 2 10 BKN 29.96 D10 ക്രദ്ദേ 72 9 10 BKN 29 96 20 CDICD **ന**ടമ 2 7/ OHO 21 72 29.98 ^ **030** 040 2 10 035 20 72 030 2 620 οū 10 1 2998 21 040 20 10 020 70 050! 20 OVC 30.00 10 5 22 10 29.99 2 7*@* 020 **09**6 23 lØ 4 060 941010 30,00 رں Φ3v 3 (2) 70 24 10 TO T 1). OPERATIONAL SUMMARY INITIALS STATUS AT GOO! CHECK LIST 1230 BeF MATERIAL CONDITION 4 OKE I. Held quarters. READINESS CONDITION 2. Chronometer(s) wound. PAW 1100 OPERATIONAL STATUS BRF 1945 ALPHA 3. Held evening reports. NO 122 IN HM10 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 64°E MACHINERY COMDITION AND DISCREPANCIES DRILLE AND TRAINING Began Ended Type AW MACHUERY **200** ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES AVLATES XMX 14/4RC-9 Auth. Attached Leave TAD Other On-Board D-10 SUNSET CO

DEPARTMENT OF

TR.	PARTIMEN ANSPORT S. COAST 4380B (Re	ATION GUAR	D		LO	G - WEA	THER OBS	ERVAT	IOH AN	D OPE	RATIONA	L SUMM	ARY SH	EET		
	((-431.1)							DAY		DATE		ZONE D	ESTENATES			
US	scc C	VIC	OROL	<u>s (r</u>	MEC	627			VDAY		MAR 87	+5	Kon	1 <i>e</i> 0		
<u></u>			T		т —	,	1. WEATH			15		, -				
TIME		TH S	, —	INDS IF	V151.	WEATHER		I .	RATURE (rees)		Loues	SEA	SEA B		SWELL	MAYES
	MILES	168	(ON (True)	(Knots)	BILITY	(Symbole)	BAROMETER (Inches) SEA LEVEL	DRY BUL B	WET BUL S	AMOUN:	į	TEMP.	100	HEIGHT (Foot)	DIRECT- ION (True)	HEI GRI (Feet)
ļ .,	6	9	039	19	14	GKN	29,98	73	<u>ټ</u>	7	<i>Cu</i>	74	000	1	(4) 3/4	.3
0.2	9	6	459	19	100	OVC	29,96	73	65	10	Cu	74	010	1	640	3
0.3	Q	0	060	20	10	0 VC	19.95	73	66	(4)	Cu	74	DYO	1	054	Z
04	6	(055	18	La	BKN	29.45	73	66	9	CU	700	ma	2	060	2.
05	7	5	055		10	CUC	29.96	73	66	10	CU	71	azo	12	0,60	2
06	7	8	(DSP)		10	BEN	29.49	73	66	08	10	12	Med	2	060	2_
07	7	8	045	21	10	avc.	3000	73	66	10	اد.ن	12	245	3	080	2_
00	7	5	050	21	صد	ove	30.00	73	66	10	<u>Cu</u>	71	040	2	080	2
09	5	2	Viz	19	8	OVC	30.03	74	67	10	Cu	72	00	2	050	7
10	2	5	060	20	8	OVC	30.04	74	67	10	Cu	72	060	2	528	2
''	<u> </u>	1	1060	15	8	ovc	30.05	74	67	10		71	060	2	010	2
12		7	060	18	8	OVC	30,01	75	67	Læ	ja	74	060	2	040	4
13	_7_	0	675	19	9	OVC	30.01	75	67	10	Cu		94 4	2	030	4
L''	6	8	965		14	BKN	29.98	75	68	8	Co	74	054	2	4 54	4
15	7	7	058	34	14	BKN	29.98	75	69	17	ر ک	74	060	2	070	5
16	6	4	055	26	10	BKN	29,96	75	68	9	ري	73	045	3	035	3
17	7	0	055	25	100	BKN	2996	75	68	8	CU	73	Our	3	(V)3-2	- 3
18	7	5	<u>055</u>	25	100	SCT	29.95	75	68	12	CU	74	035	T	W35	2_
19	_7	0	\$5 \$	2.3	10	SCT	2996	75	70	11	C U	72	P35	3	020	2
20	7	පූ	054	<u> </u>	10	CLR	29.99	76	19	I Q	<u> </u>	72	090	1	070	2
21		4	048	25	10	ar	29.99	76	30	0		71	090	+	070	2
22		1	040	18	10	CLR	29.98	76	70	10	<u> </u>	71	070	Z	060	2
2.2	8	2	068	14	10	Det.	29.99	76	10	11	<u>Qu</u>	70	070		090	
24	7	5	Ø75	(5)	14	ScT	29.98	76	70	3	Cu	73	07.0	5	050	
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							11. OPERAT	I IUNAL S	UMMARY				, 		г	
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DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) VESSEL WEATHER ZONE DESTINATION DAY DATE VIGOROUS (WMGC 627) +5 Romes 16 Mar 87 MONDAY USCG C I. WEATHER OBSERVATIONS WINDS IF TEMPERATURE ESTIMATED (Degrees) CLOUDS SEA BAVES A 3 2 SWELL WAVES MILES DIRECT-FORCE TIME VISI-WEATHER BAROMETER BATER DIRECT. I RECT-3 | NE | GN T |(F **!) ION B11.174 AMOUN . TYPE TEMP. ICN Knots. Symbole (Inches) الله (آق (True) (Miles) SEA LEYEL BUL B airt & True D6 Z BKN 76 72 0 1 0608 15 10 29.95 10 030 460 0.7 29.95 6 BKN 72 060 181 1 0 76 70 Ø7 0.3 235 29.84 7 (4) BKN Cu 74 04 160 0.4 8 4 08CP 10 SCT 24 44 12 05 73 Ma 77 05 8 7590 5 10 567 76 70 03 72 2994 /00 0/0 06 SCAH 5 **0**8 1946 75 72 BRO 7/ ر ں 0.7 69 29.98 75 090 03 04 72 2 S≈7/H 090 08 €œ 05 09 Moodel) ı۵ U/ h 11 74 12 29.97 270 لهيم 85 10 05 4 76 9 12 15 272 3.5 10 BKN 29.97 85 75 45 Cu 76 13 310 <u>GKN</u> ربک 5 29.97 6 84 73 45 76 (4 5 354 329 ሌ 12 O 10 BKN 29.92 82 72 74 335 5 **ø**5 15 29.91 309 4 6 BKN 8((0 7(96 335 76 16 1751 2 300 フ +0 SCT 2940 80 74 72 3**8**W 17 12 5 cT 13 14 351 310 010 80 10 2990 Ci 2 23 18 ora 2989 Leo SLT 76 73 Ci 74 **0**36 4 035 3 2 1 OD 0 022 19 Lo 29.92 76 **022** 54 71 3 74 035 3 Cί 20 6 030 ZQ Ю Scr 2994 73 2 C (73 **മ**3ൾ 250 <u>ڪ</u> 21 10 053 34 2 Sui LO 76 72 2 030 020 79.95 22 0 35 Set 3 10 77 Z 030 72 **040** 23 ୦୪୭ 23 79.95 10 SUT 72 72 050 8 BKN 24 **675** 29.94 TO T 204 0 11. OPERATIONAL SUMMARY STATUS AT DOOL CHECK LIST TIME INITIALS MATERIAL CONDITION YOKE BeF 1. Held quarters. 09.40 READINESS CONDITION BUF 2. Chronometer(s) wound. 1(30 OPERATIONAL STATUS 1945 ALPHA BeF 3. Held evening reports. MISSION HMIO 4. Magazines inspected. 1127 Bef 4a. Maximum temperature: 4b. Minimum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING MACHINERY Began Ended Туре LOGS 1251 1235 MAN OUBEBOARD ELECTRONIC/COMMUNICATION CORDITION AND DISCREPANCIES 23 Kask AV/URC-9 Auth. Attached TAD Other On Board D - 12\$11 B MUZ PURSET. 1804 0604

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) 77 S S S C - 4 3 S S S S S DATE ZONE DESTINATION GAY 17 MAR 87 +5 Romeo TUESDAY USCGC VIGOROUS (WMEG-627) 1. WEATHER OBSERVATIONS WINDS IF TEMPERATURE ESTIMATED CLOUES SEA BAVES SEA (Degrees) SWELL WAVES BIRECY- FARCE DIRECT. IME MILES .1214 REATHER BAROMFTER BATER DIRECT-3 3 5 t CN BILLTY (Symbole) (Inches) 094 WF 1 AMDUN' TEMP. ION IDN (Knots) (True) (Miles) SEA LEVEL 8111 B BUL B Tenth, (True) 9 2 76 72 72 4 C93 20.5 BKN 08 C 14 29.92 $C \cup$ 01 76 Cu 72 7 0: 16 BKN 29.91 70 085 (n)103 lφ 0.3 BKN 29.91 75 Ćυ 70 2 5 Q **3250** D95 0 10 lΦ 0 4 **1**99 17 71 Z 110 LO 2440 75 4 ںے 71 (D75 Z SL7 05 72 5 رں 3140 29.9z 72 W15 1 D 17 Sit 290 LOD 06 10 SLT 2944 76 13 4 7O 040 045 14 (0 O75 Z 0.7 2996 75 075 BKN 490 Z icho 14 15 08 ()K~ 29.99 73 10 سے 086 17 ര 7/ 060 000 09 055 10 30.00 77 72 13×~ 050 (da) 3 10 9 **BBI** 22 lØ) BKN 29.78 72 Cb/ci Ø81 75 71 0X5 3 ,, 060 30.00 72 13 BKN 10 270 070 2 12 71 BKN 29.98 Ø70 4 Œ 17 8 د ت 1085 W70 10 7w 13 4 11 081 15.5 BANYHI 29.97 76 71 8 Cu 70 W85 065 **(b**) 14 13 73 030 (1) 2994 6 71 2 070 14.00 3KN CU 075 15 14 18.0 **4054** SCT 2996 77 74 3 2 20 ମଧ୍ୟ n Ra SCT 29.9 U 16 **658** CU 70 040 070 29.94 SCT 17 A70 10 0801 2 വ 20 050 88 090 29.94 10 10 10 BKN CO 060 D15 ලුපුර 29.95 3 Ø *0*58 10 چىر 070 19 10 2 7 (70 3 ပည 20 48 10 29.95 71 070 062 76 10 **کر**7 21 2 29,96 12 095 10 15 Set 074 10 7/ **085** 76 ں ک 19 29.95 3 ΙØ **b**88 Six 76 7(4 دب 72 070 **DS**W 22 10 23 **35**0 29.95 065 9 093 19 BKN ں ح 3 74 7Z 10 7/ 6 ł 10 10 2994 68¢ 3 075 Si-7 12 CU 72 095 101 707 11. OPERATIONAL SUMMARY STATUS AT GOO! INITIALS CHECK LIST TIME MATERIAL COMDITION YOKE 1225 1. Held aucaters. READINESS CONDITION W 2. Chronometer(s) wound. 1201 OPERATIONAL STATUS ALPHA 2045 3. Held evening reports. M012219 Ber HMIO 4. Magazines inspected. **209** 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES BRILLS AND TRAINING Began Foded Type MW MACHINERY, LOGS ELEGIGORIC/COMMUNICATION CONDITION AND DISCREPANCIES . . ANKAS-23 KATR Auth. Attached TAD Other On-Board Leave D-13 · BUNSET 1011111 065 38 1809

U.	PARTMEN ANSPORT S. COAST -4380B (Re	ATION GUAR v 3-67	D D		LO	G - WEA	THER OBS		OH AN	OPER	ATIONAI					
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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380R (Rev 3-67) 46154FS 132234 ZONE DESTINATION +5 ROMEO usca Gerene 19 MAR 87 1. WEATHER OBSERVATIONS TEMPERATURE WINDS IF ESTIMATED SEA BAVES CLOUES SWELL WAVES (Degrees) Ë WATER DIRECT. mineer. TIME MILES FORCE 4151 -WEATHER. BAROMETER RECT E . £ ... BILLTY DRY #F1 AMBUN' TYPE TEMP 104 104 1 Q N (Inches) (Knotz: Simbole ¥ 5 Ē (True) (Miles) SEA LEVEL BUL B **SUL 8** Ten the Degrees) This 14 2444 72 Occu 2 22 76 71 11 0 1 14 3 ഗളയ 0: 2 ں ک 7/ 76 2982 71 100 6 (D4W) 72 3 0.3 *ගප*ඨ 3 26 LO 72 100 BLS 2987 76 28-5 ジング 0 4 OGS D २५ ८६ 72 3 72 090 2 <u>090</u>2 20 3 0.5 79.88 حب 71 U90 C_cC 2 79S 20 10 72 تحن 090 275 06 Le BKN 29.90 095 72 26 14 u 25 C95 ٤ 07 29.91 CuCEC 7 Z ھد 71 14 O 100 Size-100 ں ے 72 4 0.8 29.42 obo 16 0 110 27 10 BKW 7 5 Cu BKN 72 (Ø ø Z 080 24 io 29.92 09 14 77 72 110 یے න 71 72 3 10 35 Scr 29.42 2 0 8x 14 100 10 104 Mo 11 72 رر 4 9 990 10 29.91 **D80** 32 Sct 78 72 29.92 73 78 2 72 ۷ 1 2 LØ Scr CU 095 080 **∞**₹5 32 IΦ 3 13 0090 29,87 80 00 D80 10 5-7 74 C U 73 13 29 72 095 14 29.85 ජි0 کب 2 ೦೪೦ 20 10 4 100 29.85 15 72 72 040 20 10 Set 72 79 080 20 10 SLI 29.83 ريي 080 2 060 16 17 10 BKN 78 73 700 0800 OXO D10 29.83 ധ Z 20 72 3 5 BKN 29.84 72 6 2 Q65 18 075 22 LØ 77 **Ø75** Cu/c 3 منت 0 29.85 71 Q75 2 BKL i 9 21 10 ውራያ 110 Cu 72 065 **675** 3 5 120 28 29.84 7 20 (a) (Ø Cu 29.88 73 5 **675** 21 9 122 26 O BKN **065** <u>C</u>u Sit 29.88 73 42 5 **U** 5 6 24 080 5 120 10 22 23 3 **Ø**2 Cu 72 Ø75 1P 8 120 29.87 **U80** 10 14 74 20 101 11, OPERATIONAL SUMMARY INITIALS STATUS AT 0001 CHECK LIST TIME MATERIAL CONDITION YOKE PAW 1. Held quarters. 25 READINESS CONDITION 11 300 ₹w TV 2. Chronometer(s) wound. ac OPERATIONAL STATUS 19 45 AZOHA 3. Held evening reports. MISSION 0842 4. Magazines inspected. UE HMIO 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING TAW Ended Type Began MACHINERY <u> 4065</u> ELECTRONIC/COMMUNICATION CONSITION AND DISCREPANCIES 10/wer -22 xxxx WE TAD Other On Board Auth. Attached Leave D-15 TURE 111 0558 SUNSET. 1756

DEPARTMENT OF TRANSPORTATION LOG . WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) VESSEL SALATE JONE DESTINATION DATE (WMEC-627 VIGGROUS +5 30MEC EU MARY PHONY I. WEATHER OBSERVATIONS TINOS IF TEMPERATURE ESTIMATED cuades 23 4 4 8 (Degrees) CFA. SEA BAVES SWELL TIME MILES DIRECT- I FORCE *151* WEATHER BAROMETER WATER AFCT. RECT HEI GH F 3 (Feet) 10N 85 L 1 TY Symbole WF T 1 EMP . (Knots) (Inches) AMOUN 10% 10H (True) (Miles) SEA LEVEL But 8 8UL 8 Tentha, True Dog: eea ٤ 194 10 7.3 27 art. Z 0 1 12 2 ر ن 72 0.2 250 235 15 a 9 Lee 72 J'10 nι 254 1d) ur 77 Ø 72 W D80 70 W76 0.4 9 235 12 7982 77 73 0 71 2 14 TO CLR 070 258 Ō 12 **(**2) 10 LØ 19.83 78 CSO! 74 71 2 15/5 06 274 19.84 230 SO 78 74 ٦ $\langle T \rangle$ Set $\Omega(d\Omega)$ 07 29.87 28 حي 7 (Ø LØ Sur 260 240 2 0.8 14 249 29.89 82 3 Cu Φ 04 75 72 10 250 1000 2 Scr 09 15 286 24 29.88 75 72 Cu 82 10 4 260 ((0 2 10 9 ScT 275 29.89 83 76 4 (24 (0 Cu 74 260 3 10 268 11 6 Š Ø9 Sct 29.87 84 76 ٤ Cı 74 120 3 270 10 12 10 8 240 29 86 74 9 LO 76 Seo SCT 220 ۷, 13 750 7984 84 Ø n 400 CLR 75 ← 210 **CO**CO 23 14 $\bar{s} \infty$ 230 83 Ø 73 2 8 10 حله 29.87 75 200 15 0 2 ,SQD 12 10 حده 79.81 81 73 190 190 236 10 CLR 29.80 76 16 Φ 81 **Ø** 74 190 .5 **7**24 17 281 29.81 כט 230 10 5 2 10 30 75 73 200 4.2 2 28.82 75 Cu 73 226 la ScT 231. Zaw 19 9 6 775 KD SCT 2984 79 CU 75 73 300 5 ععر 5 3 8 280 2984 10 ur 75 200 230 0 73 2 21 255 2984 78 75 <u> 23a</u> 72 250 Z 0 22 7 10 29.85 CLR 74 72 2 Ø **239** 23 310 2984 O 190 CUR 300 Ø 13 24 Ø 310 CU 73 300 74 TO T 11. OPERATIONAL SUMMARY STATUS AT GOO! CHECK LIST INITIALS TIME MATERIAL COMPLITION YOKE 1225 PACU 1. Held quarters. READINESS CONDITION T 2. Chronometer(s) wound. After 130 OPERATIONAL STATUS ALPHA 3. Held evening reports. 1945 PAW H01221M E HMIO 4. Magazines inspected. PHW 4a. Maximum temperature: 4b. Minimum temperature: 810= 70°F MACHINERY CONDITION AND DISCREPANCIES DRILLE AND TRAINING 14W LOGS Began Ended MACHINERY MICATION COMBITION AND DISCREPANCIES Kark 4VE Auth. Attached Leave TAD Other On Board D-16. SUMBISE SUBSET 1816 0554

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINAT. 28 VESSEL BRETTON USCGC VIGOROUS (WMEC 627) 21 MAR 87 SATURDAY I. WEATHER OBSERVATIONS ESTIMATED TEMPERATURE WINGS IF 20005 SEA SEA BAVES SEEL BAVES (Degrees) WATER GIRECT. DIRECT-FORCE 23.118 V151-BAROMETER COTRECT- I BEATHER Feet) 3 TEMP. ION 108 WET AMOUN! (Symbole) (Inches) (Knots) <u>.</u> (True) (Miles) BUL B SEA LEVEL BUL B True 74 295 CLR 29.82 77 1.5 300 [2 Ø LO 0 1 352 74 310 13 29.80 0 0.3 Ø 352 Ι¢ CLR 310 76 .5 0.3 29,80 $\phi \phi \phi \phi$ 0 જ 12 10 73 Ø 000 Ø 33p 0.4 015 29.81 0 76 77 [D CCR 6 رن 300 0.5 72 7.4 29.82 73 721 92 14 ac 0 72 32a 74 06 7 8 BKN 29.83 77 06 ىت 055 10 74 07 82 76 ں ع 32₀ 29.84 060 7 10 Sct 0.0 74 320 10 87 10 74 2486 NDO 527 09 SCT 2488 80 ĊU 73 320 S 90 DHO 10 UR 80 CU 73 Z987 1710 10 40 11 e1 フレ 10 CCR 2986 92 Œ 8 80 10 0 72 1.2 0 29,84 _ _ 79 72 10 0 13 29.81 292 CLR 8 2979 0 72 90 78 3 10 ar 78 1 77 --29.79 90 cuki Set LIGHT & VARIABLE lø 76 92 7 SCT 29.78 78 Cu/Ci CALM 16 10 75 CU Scr 29.78 9 85 76 ι 17 Ŀ 032 05 lo 75 29.78 Cu 18 020 10 (4 Scr 80 73 4 75 00 75 29.78 Φ D12 80 19 135 LO Sit (20 29.78 74 0 75 10 CLR 1 P 044 21 75 OZS W25 111 10 CLR 29.80 79 75 CD 74 CLR (DZW 22 14 4,82 79 75 **Ø** (1) 24 73 23 74 CLR 79 Ø DZO 12 10 29.84 29.78 19 480 080 014 74 24 5 10 TOT Я 11. OPERATIONAL SUMMARY TIME INITIALS CHECK LIST STATUS AT DOD! Ber MATERIAL COMDITION 1240 YOKE 1. Held quarters. READINESS COMDITION 8AW 2. Chronometer(s) wound. 1000 Y OPERATIONAL STATUS PAW 1945 ALPHA 3. Held evening reports. M01221W PALL ORISTAL LE - HMIO 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 7100 87°F MACHINERY CONDITION AND DISCREPANCIES BRILLS AND TRAINING TAW MACHINERY LOGS Ended Began ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES TAD Other On- Board Auth. Attached Leave D-17 SUNAISE 4 554 SUPSET 1806

TR.	PARTMEN ANSPORT S. COAST 4380B (Re	GUAR			LO	G - WEA	THER OBS	ERVAT	IOH A	MD	OP ERA	ATIONA	L SUM	AARY S	HEET		
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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) DATE ZONE DESTINATION VESSEL STEFFE Komez 23MM87 MOVDAY VIGOROUS (WINER 627) uscg C 1. WEATHER OBSERVATIONS TINOS IF TEMPERATURE SEA WAVES ESTIMATED CF OF C 2 SEA SWELL WAYES (Degrees) E E WATER DIRECT-DIRECT DIRECT-FORCE VISI-PEATHER TIME MILES BAROMETER 5 : HEIGHT (Feet) TEMP. ION ION TYPE BILITY DRY WET AMOUN S ION (Symbols) (Inches) (Knots) (True) (Miles) True True BUL B SEA LEVEL BUL 6 Tentha Degrees. دد 72 674 54 29.74 77 74 3 110 0 103 15 10 11 0 1 110 ں ک 72 W70 15 7 1 0 : 100 10 SUT 29.76 77 73 11 △ 72 4 W90 0) 12 77 73 8 464 SUT 29.73 10 10 0.4 3 Cu 74 100 Z 29.74 77 73 114 7 69 Ser 14 10 074 CU 0.5 74 2 73 4 090 1 SUT 29.74 100 9 Φ 05 10 10000 Cı/Cu ۲S 06 BKN 29.74 77 73 Ç 48a UW 1 090 04 10 Φ 74 **09**0 0 1 78 دح 74 29.76 6 470 126 10 BKN Z 10 0.8 28 74 CU W 14 24 77 07W 074 > 17 15 10C 10 070 75 +66 CU 0.9 14 80 73 070 <u>5</u> 026 10 BKN 2976 020 73 Qi 6 CU 10 76 Ø7W IW ۲ 100 4 16 2977 07W BKN 2 72 11 دں 77 09KD 10 ക്ഷ 3 DP(D) ID **4**2971 78**9** 8 29,75 BI 72 066 080 12 90 10 2.5 Sir 88 79 72 **७**७७ 8 **000** 13 <u> 29.73</u> 14 0 064 10 72 Ci 14 Scr 29.73 85 79 090 llo 195 4 1a Ci 72 15 11 9 10 22.70 76 1 090 SUT 84 080 lo 73 76 29.71 27 CU W80 9 ØQ 16 7 060 IΦ SCT 8 Cu 75 17 8 (דד ලකු D 088 10.5 14 كلان 29.71 8 77 CU 74 18 8 ന്നുഗ 13 10 BKN 29.72 1000 3 8 رں 81 73 മ8മ 2 19 7 77 14 0 110 10 BKN 29,76 080 *1*885 OVC 10 72 ಯ 20 20 $T \infty$ 29,80 LO as <u>(XoC)</u> 21 Olec 29 79.81 10 ΛIC / O 72 74 2 C_{u} යරිට 020 22 <u> </u>26 2 01 ove 29.82 10 35 23 8 74 73 Ø80 050 Z LØ 29.81 **BUF** $\tau \omega$ Cu 74 73 **U**S 5 29.79 BKN 24 10 101 11. OPERATIONAL SUMMARY INITIALS CHECK LIST TIME STATUS AT 0001 MATERIAL CONDITION Bes 1230 YOKE 1. Held quarters. READINESS CONDITION BUF 2. Chronometer(s) wound. 1120 TI OPERATIONAL STATUS BeF 194 ALPHA 3. Held evening reports. MISSION 4. Magazines inspected. 0748 HMIO 4b. Minimum temperature: 4a. Maximum temperature: 87°F 73°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended Began Туре MACHINERY 1154 /0Y3 RUBBIER DOCKING ELECTRONIC/COMMUNICATION CONSITION AND DISCREPANCIES . . ANJUD - 23 XMPR n/C-9 Auth. Attached Leave TAD Other On Board D - 19. SUMBISE 39H8E7 1803 Ø555

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) VESSEL STATION DATE +5 Romes TUESDAY 24 Mar 87 USCGC VIGOROUS (WMGR 627) 1. WEATHER OBSERVATIONS TINOS IF TEMPERATURE ESTIMATED (Degrees) CLOUDS SEA BAYES SWELL WAVES Ξ MILES DIRECT 1010 VISI-WEATHER BAROMETER WATER DIRECT. HEI GHT (Poot) DIRECT-.... £ : ION (Inches) 1798 (Symbole) WET AMBUN! TEMP (Knots) 1 DM (True) (Miles) SEA LEVEL BUL B BUL B Tentha) (True) Degrees) (True) 21 10 Cu 74 074 14 BKNI 29.79 we? 054 0 1 7ረ. 480 Z. BKN 25.76 60 74 0.2 8 070 20 76 $C_{\bullet \cup}$ 10 10 73 450 Ø 74 て Sur 29.14 Cu 14 *ბ*57 le 73 43 74 **0**50 W70 2 0.4 29.74 ω 80 18 74 2 74 10 080 ヱ 110 0.5 17 5 10 24.76 Z8 77 **6**0 02D 73 D&4 Z 054 0.6 10 18 10 040 ove 2976 74 كرن 73 10 0340 284 2 OPO BKW 29.80 73 Ø 10 90 0 090 08 MODRED 09 10 11 12 298/ ઈઢ 3 SLT رے MOORBO 140 05 13 14 15 mooreo 135 CLR 298a 86 79 12 10 W 16 19 20 mooken 130 10 2978 80 0 21 22 23 MOORED ID LLR 2476 17 74 0 10 T 70 4 11. OPERATIONAL SUMMARY STATUS AT GOOL CHECK LIST TIME INITIALS MATERIAL CONDITION YOKE I. Held quarters. 1220 PAW READINESS CONDITION V 2. Chronometer(s) wound. OPERATIONAL STATUS ALPHA 1945 PAW 3. Held evening reports. MISSION 4. Magazines inspected. 85 7 4a. Maximum temperature: 4b. Minimum temperature: 85 73°E MACHINERY CORDITION AND DISCREPANCIES DRILLS AND TRAINING IAW MACKINDRY Began Ended Æ. ELEGTRONIC/COMMUNICATION COMBITION AND BISCREPANCIES Auth. Attached Leave TAD Other On Board D - 20100 A 181 0 6 0 3 SUNSET 1813

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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD ZONE DESTINATION VESSEL -ETATION DAV DATE +5 Komeo 26 MHK 87 THURSDAY USCGC VIGOROUS (WMEC 627) I. WEATHER OBSERVATIONS TINDS IF TEMPERATURE SEA WAVES SWELL WAVES DL DUCS A 3 2 ESTIMATED (Degrees) DIRECT. BATER DIRECT-DIRECT-Farer WEATHER BAROMETER (Feet) MILES ¥151+ HEIGHT TIME DRY WE T AMOUN TEMP. I ON ION BILLTY Symbole (Inches) (Knots) (True) (True (Miles SEA LEVEL BUL B 8UL 8 Tentha) Degrees) Cu 1 74 2 29.95 73 ScT 68 10 5 **Φ73** 17.5 (D76) C044 10 0 1 ں ک 3 72 3 54 29.93 73 رع ب 670 044 6.2 7 19.0 082 (0 7Z 3 68 2 Cu **B4070** 29.92 73 040 0.3 حىك **1277** (B.J. 10 3 <u>ن</u>) 72 0.4 73 68 4:70 040 2 24.91 COAW 1961 10 541 17 0.5 ゚゙゙゙゙゙゙゙゙゙ CU 7Z 070 Z **0**80 Z 73 67 2493 18 IΦ SCT 15 **1990** 3 13 06 4. 29 95 68 حرن Ø 70 TO 60 DEC 10 6 15 07 73 **09**(t) 24 46 68 3 lw W മാഗ 14 SCT CU 15 14 100 73 2 08 29 110 12 0 039 18 DI Scr 29.97 110 2 2 70 3 100 يح ىت 73 09 12 0 085 70 Z J I S 2 29.97 Cu 72 //0 10 77 کرتے 20 15 σ 083 10 2 <u> چ</u>پ 2 2 70 72 11 090 18 29.98 フて 110 120 Ser 12 2 20 72 080 3 29.95 80 71 Cu(QO 12 8 15.5 BKN 097 10 3 70 2 72 ے کے 106 12 12.2 Sur 29.94 80 LOO 13 106 10 290 700 حي 72 Ø69 3 969 29.91 3 78 10 10 Scr 088 29.90 $C_{\mathcal{O}}$ 77 7Φ 5 72 **Ø73** 073 lØ 72 83 2 حيي 080 ථාජීග 29.90 72 2 090 21 10 <u>کرہ</u> 16 6 610 79.90 78 70 71 **29**0 20 17 11 9 068 **3** 10 090 71 090 סר 79.90 18 LØ 30 LO 065 3 29.92 Z 72 070 රපා 76 <u>073</u> Scr 70 Ø 18 01 10 74 070 3 76 C \vec{u} **(1)50** 29-94 70 20 3 051 18 Set w 74 a 80 ScT 69 ں کے 29.98 060 മേള 21 u (0 083 BKN 29.99 68 C U 73 675 09C 4 18 10 10 3 73 Sir 29.98 68 4 23 00900 ප 102 10 **Ø75** 9 Z9 98 68 2 099 24 75 20 1000 28 lo 105 297 TO T 11. OPERATIONAL SUMMARY TIME INITIALS STATUS AT 0001 CHECK LIST 1225 MATERIAL CONDITION Yoke 1. Held quarters. PEADIMESS COMOITION BCF 1113 2. Chronometer(s) wound. IV OPERATIONAL STATUS 1945 BRAVE CHARLIE 3. Held evening reports. MISSION 4. Magazines inspected. House / 4b. Minimum temperature: 4q. Maximum temperature: 82°F 70°F MACHINERY CONDITION AND BISCREPANCIES DRILLS AND TRAINING Began Ended .. Type IAW MACHINECH LOGS 1348 GO-BATTLE PROBLEM 457 1450 SIGNALS - CHALLENGE ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES ٠. West -22 X149K Auth. Attached TAD Other On Board Legve D-22 SWIE 06565 SUNSET. 1804

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINAT . 3H (SSEC STATION WMEC -62.7 FIGOR-+ 5 ROWEC VIGOROUS 27MM2 87 USCG 1. WEATHER OBSERVATIONS TINOS IF TEMPERATURE SEA SEA BAVES SWELL WAVES (Degrees) 03TAMATED TH S -DIRECT DIRECT FARCE WISI -WEATHER BAROMETER MILES hEIGHT (Foot) IME 3 AMOUN " TYPE TEMP. 10% ION (Inches) 10M (Knots) (Symbole) (True) (Miles) SEA LEVEL BUL B BUL S (True) 044 68 73 Q (d) St 1 75 $\mathcal{C}^{\mathcal{C}}$ 24 lΨ 2946 14 0 1 lwc 73 09io 7 75 68 3 ىت 13 9d 0 ? Sur W 2994 Φ 3 073 62 Q.10 0.3 75 15.7 (C) 24.43 11 ilbu ίΦ 79.93 73 2 100 0.4 75 60 100 097 مد کرت 72 Sur 29.92 75 3 CL Z 100 3 هد 100 *(a* & 093 Ø Cu Z 29.91 110 110 0.6 70 0 L9 ĹΩ 75 070 72 110 07 2 TO 29.91 69 100 2 170 Ø Se~ 29.92 79 71 Cı 72 090 2 0.8 100 2 120 (φ 11 74 3 OGO 29.91 01 72 Cu 080 Sct 09 4 9 120 13 10 ںے 73 3 29.93 81 72 107g 685 SiT 1391 10 Z 9 10 ں ۲ 74 080 474 3 29.92 82 70 14 SCT 11 698 10 81 CU 74 29.43 2 12 73 **070 മ**ളമ 18 D ScT 2 094 73 74 MO 13 09 41 29 94 පත LU DPD 014 Иb 4 78 78 (b 73 090 080 14 4 10 CLR 2943 010 **0**289 CPA 0 74 15 085 21 10 CLR 2991 71 74 10 CUR 29.90 78 71 0 _ 100 110 090 16 0 74 100 110 UR 29 89 مد 70 17 090 15 $\boldsymbol{\mathcal{Q}}$ Cu 73 100 110 2 18 22 70 29.91 74 70 4 082 Set. 70 73 Sei 2 شد 070 090 5 29.91 77 ZI カフS 70 19 CU 2 490 71 484 5 10 Suc 29.93 77 20 30 087 74 080 29.95 21 SUZ 7Φ 120 09 C 10 29.95 3 ري **48**0 5 @74 26 70 (00 22 10 A a 80 3 26 Z 23 29.93 70 (40 074 10 u 2991 7 tg t 11. OPERATIONAL SUMMARY TIME INITIALS STATUS AT GOO! CHECK LIST Bef MATERIAL CONDITION 230 YOKE 1. Held quarters. READINESS CONDITION BAU W 2. Chronometer(s) wound. 1100 1945 SUTATE JAMOITARES ALPHA 3. Held evening reports. MIZZION 1100 umio -4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 70°F 20°F MACHINERY CONDITION AND DISCREPANCIES BRILLS AND TRAINING Ended Type KCHIN FRY ., .. Began ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES /wer-23 KARR LRC-9 UNF Leave On Board Attoched TAD Other Auth. D-23 SUMBISE DIO SUNSET. 1808

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) VESSE SPECIE DATE ZONE DESTINATION WMEC 627 USCG C TS MARS 7 VIGOROUS ATURDAY +5 ROMEO I. WEATHER OBSERVATIONS #1#B5 15 TEMPERATURE DETAMITES (Degrees) CLOUCS SEA SEA WAVES SWELL WAVES MILES FORCE IME WEATHER DIRECT. BAROMETER WATER DIRECT. 5 h [| GM | (Feet) I O M Knots) BILLTY (Symbole) (Inches) DBY ... AMOUNT. TYPE TEMP. 104 10 M (True) (Miles) SEA LEVEL BUL B 817. 8 Tentha. Degrees, True True, cur 5 DHW iQ W 2989 77 74 Ú 74 $\psi u \psi$ Die 140 2486 77 74 14 UR ZØ luw Ø 0.3 3 11 5 140 140 un 7486 77 74 W 70 0 4 10 172 79,90 77 74 6 07 10 كحرت 70 100 0.5 حب S 10 29.91 172 07 ScT 100 7.4 06 29.92 210 10 10 کرت 77 72 73 110 1 0.7 08 _ 4 225 29.94 80 74 73 080 10 Scr 0.0 9 08 Set 29.97 85 75 74 227 10 ر ن 060 1 3 90 09 224 29.98 **1**7 w ScT 74 U34 10 93 6 210 DG 78 CU 5ςτ 30.00 74 000 (P 1 11 5 29.98 74 0 170 03 (4) ScT 91 78 כט **ን**ወወ 12 10 29,96 **E4132** 78 Scī 74 030 13 ري 4 CD 140 W 2944 86 5L7 77 74 Œ 14 73 3 6 79 140 10 SCT 2992 90 ں ے 200 15 9 140 6 10 UR 2990 91 74 74 180 145 29.88 16 CLR පිර 0 18¢ 10 _ 17 ľO 130 3 UR 2488 87 77 Ø 74 10 180 350 18 15 000 14 10 CIR 29.88 81 Ø 29.90 19 15 19 0 73 *3*50 350 0 10 _ 3φ 20 14 6 **68**0 10 29.92 78 75 354 72 Ø 000 8 21 **4**78 24 10 Ø CLR ファ 2 100 000 Ø80 11 **(2)** 2 3 22 (P CLR 29.95 77 72 0 74 090 000 23 29.93 3 084 17 100 Set 74 080 2 (VO) 24 23 $\mathbf{O}\mathbf{R}\mathbf{O}$ SUT W TO T 185 Ò 11. OPERATIONAL SUMMARY STATUS AT DOOT CHECK LIST TIME 2 JAITIMI MATERIAL CONDITION YOKE 1230 BU Held quarters. READINESS CONDITION W 2. Chronometer(s) wound. PAW 100 OPERATIONAL STATUS ARPHA 2000 3. Held evening reports. M01221M HMIO - L/E 4. Magazines inspected. ወጓፘጛ 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAIRING MACHWERY Began Ended Туре LOGS ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES re - 9 UM AN/WET- 23 XMPR On Board Auth. Attached Leave TAD Other D-24 SUNNISE 0552 SUNSET 180-

DEPARTMENT OF TRA SPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) ZONE DESTINATION DATE WMEC VIGOROUS 627 ROMEC 24 MAR8Z USCG< <u>4100.0</u> 1. WEATHER OBSERVATIONS TIMOS IF TEMPERATURE 210015 SEA WAVES SEA SWELL WAVES ESTIMATER (Degrees) DIRECT. FORCE WATER 5 BIRECT. h E I GN F (Foot) MILES 4151 -WEATHER BAROMETER TIME 1 Y P S 1 E MP . 1 O M **#** 6 1 AMBUR -ION (Symbole) (Inches) (True) True (Miles SEA LEVEL BUL 9 8UL 9 (True) 1040 2942 3 ر ں 2 C Ca COAU 24 14 72 10 0 1 2493 72 Wis 2 100 77 ı 8.2 OPU 20 10 Sui 1 1 Z Deid 0.3 18 2992 72 104 0 WW 10 547 29.92 73 EXA 2 ı Cu 75 080 L 0 4 11 0 088 16 71 0.5 7993 75 71 Cu 050 060 8 081 2.0 10 050 73 9 20 29. 94 ميث 060 7 0.6 090 71 10 40 29.96 050 090 18 7 71 73 060 ح 0 11 C 0.8 29.96 පග 73 3 CU 084 080 10 095 (4) 2 29.97 73 084 12 070 22 78 72 4 CU 100 09 P 29.98 Cυ 73 120 9 72 09a 10 2 115 17 80 4 Z (0 120 Ē 73 2 Cu W90 84 104 13 Sct 29.98 6 10 80 0090 12 13 29.95 73 1 2.3 3 100 10 15 2992 80 72 2 <u>دي</u> 73 090 100 110 SUT 7 11 14 CU Set 71 2 73 Z 125 15 29.90 79 (14 100 14 11 4 10 Cu 170 Sct 72 115 1.5 12 129 14 10 29.89 79 2 29.88 79 72 Cu 120 2 09 152 11 TO 16 115 29.89 79 72 ೦ಡಿ೦ Z 0 73 17 12 M LO CLR <u> 78</u> 080 8 79.91 73 _ 73 110 2 18 SO. 16 CLR 0 TO 73 2 29.92 73 110 OHO) 77 \mathbf{Z} 15 19 6 110 W 8 we 2992 72 CU 7.3 10 (Pa 2 1 20 110 26 ID 21 8 73 ശമം 6 1 22 lψ 29 72 ر پ 73 114 മ 8d 20 2994 22 OPS 10 72 **Ø** 74 3 085 23 8 26 (1)9ø 14 2994 Z 1085 10 2 090 5 23 10 29.9 74 080 24 12 075 tg t 11. OPERATIONAL SUMMARY INITIALS STATUS AT GOOT CHECK LIST TIME PAW MATERIAL CONDITION 122/600 YOKE 1. Held guarters. READINESS CONDITION 1150 raw 2. Chronometer(s) wound. П OPERATIONAL STATUS PAW ALPHA 2000 3. Held evening reports. #13310# ⊋તω 4. Magazines inspected. HM10 - L 1207 4b. Minimum temperature: 4a. Maximum temperature: 87°= 77°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING MIKHINFRY Ended Type ELECTRONIC/COMMUNICATION CONSITION AND DISCREPANCIES سأنسب ورزيه عياوي بأويادهم Wher-is more AC-9 44 Attached TAD Other On Board Auth. Leave D-25 · SWIELDE OSS SHESET 0 Ø 10

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) ZONE DESTINATED VEC 3 [1] 244-44-4-2 DAY DATE +5 Romec MONDAY 30 MAR ET USCGC. VIGOREN, WMEC 627 . WEATHER OBSERVATIONS WINDS IF TEMPERATURE DETAMITED (Degrees) cuaves SEA SEA BAYES SPELL E SE MILES FORCE BATER DIRECT. DIRECT WEATHER BAROMETER HEIGHT (Feet) DIRECT-Feet) TEMP. DRY WET AMOUR 100 104 BILLTY 101 (Knots) (Symbole) (Inches) (True) Ī (Miles) SEA LEVEL BUL B 8 JUS (True) (True) Tentha Degrees) 50 14 29.88 77 72 Cu 73 090142 ω 20 0 1 ഗ്ര 10 Scr 7 g 73 Cu 29.85 73 120 3 0.2 090 26 €400 2 S 0.3 22 72 73 ح 3 085 29 34 Cu (∞) 10 78 150 0 4 29.84 73 3 CU 74 3 **0**50 24 Sa 084 100 (4) 0.5 29.86 73 4 **C**u 74 78 Ø5B Scot 000 080 10 06 BKN 29.87 77 α 74 13 6 22 OSA 480 067 10 Cu 0.7 74 74 15 BKN 29.87 2 055 21 4) 050 080 0.8 14 10 29 86 74 BKN **670** 800 20 06 B ජනීග 09 13 100 55 10 29.86 80 73 CU 100 **0**90 KCT 10 11 12 13 14 Sct 29.84 MOORED 157 05 16 Cu 17 18 19 Sc727988 CALM 80 20 VO 74 21 **(**C) 276 4015 74 74 2 090 W Ø 60 14 315 10 Ø 360 22 lo 74 2 un 23 15 WA 17 jφ 547 2 73 300 ZEROGIO 29.40 74 Ī کیر 73 73 060 2 4 15 0 060 TO TO 22.89 060 78 83 TO T 11. OPERATIONAL SUMMARY STATUS AT GOO! CHECK LIST TIME INITIALS MATERIAL CONDITION TOKE 1930 BZH 1. Held quarters. READINESS CONDITION BeF 2. Chronometer(s) wound. 1130 OPERATIONAL STATUS TEPHA Pil 3. Held evening reports. 2100 Bet HA HMID/LE 4. Magazines inspected. 10 38 Mak 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLE AND TRAINING MACH, NERY Faded Type دەم Becan ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES -----**-** - - . 1465-23 xans ulc-9 unf Auth. Attached Leave TAD Other On Board D-26 SUNAISE 0555 **SUNSET**

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET " U. S. COAST GUARD CG-4380B (Rev. 3-67) WEST 484 DATE + 5 Reméi USCG C VIGOREUS (WITEC GLT) 31,4min 87 TUES WAY I. WEATHER OBSERVATIONS WINOS IF TEMPERATURE (Degrees) at au dis SEA SEA BAVES SWELL WAVES ***** 1 M.F MILES RIBERY 25072 VISI-WEATHER BATER DIRECT. BIRECT (Feet) NEI GHT 1 0 N BILLTY TEMP. WET AM OUR ' (Knots) Symbole (Inches) 10M 108 (True) (Miles) SEA LEVEL BUL 9 BUL B Tentha. True) True) Degrees 29.08 78 $\mathcal{I}\Omega$ 0 1 OBC ۶ح 2 Cu 060 060 5 78 0.2 29.86 Cu 74 12 102 12 LO OSO 060 22 29.84 18, 15 098 75 OPO 050 2 0.4 14 29.86 5 135 TØ 78 74 Cu Ø82 Z 040 05 4 130 15 2288 74 CU 73 (6 (0 BKN 090 100 14 Cu n s 29.89 74 10 125 10 BKN 6 73 080 ã 110 07 I 14 75 CU 8 12 29.90 73 120 lΦ Scr 8മ 110 Ø70 47 14 130 14 10 2992 80 75 20 73 **1074** 110 2 09 10 75 120 10 W 29 43 84 74 SCT 3 رن 110 094 2 14 8 86 2993 110 10 10 2)9e ON 0 11 14 2993 89 D9Q IOXD LUR 79 0 74 10 O90 Z 12 10 CLR 2991 89 79 74 130 0 100 8 120 13 O CLR 29 89 ខា 78 140 10 74 120 110 14 10 88 78 Ш 1987 74 170 168 LR 170 15 98 5 10 29.86 83 Сυ 190 160 ScT 73 160 " Sur 29.86 8 150 83 Cu 190 16 $\boldsymbol{\omega}$ W 73 (60 1 29.84 17 15 83 10 (4 50T 73 170 ø85 2 18 175 29.87 79 2. IP ScT 75 Cu/ci 70 *വ*85 14 170 5 ScT 29.90 74 4 19 17 178 CU ۰5 (4 184 085 20 14 178 5 KD LLT 2992 77 18a 74 080 200 5 10 SUT 2994 75 72 W N5 over 29 22 345 200 පි 10 NS 180 QQQ 70 7Œ 23 29 10 7 20 189 340 5 299z 68 72 70 Q90 24 1330 12 avc 2993 TO T 333 5 11. OPERATIONAL SUMMARY STATUS AT ODG! CHECK LIST TIME INITIALS MATERIAL COMDITION YOKE ھرے۔ 1230 1. Held quarters. READINESS CONDITION IY_ 085**0** 24W 2. Chronometer(s) wound. OPERATIONAL STATUS Aroua 1945 PAW 3. Held evening reports. 4. Magazines inspected. *0*834 4a. Maximum temperature: 87 % 67° F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING AW MACHINERY LOGS Began Ended ELECTRONIC/COMMUNICATION COMBITION AND DISCREPANCIES W/4RT-23 KAR ٠٠٠,٠٠٠ urc - 7 4HF SON -18 Attached Legve TAD Other On Board D-27 MINIST OS54 SUM SET 1812 884/1: FTS

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINAT', 20 VESSEL BRASION + 5 Romer USCGC VIGERLY (WMEC 627) WEDNESDAY OI AHEET 1. WEATHER OBSERVATIONS U #1HOS 17 TEMPERATURE CLOUES SEA BAVES SWELL WAVES SEA ESTIMATED (Degrees) BIRECT. Farci V151-BEATHER BATER DIRECT. DIRECT-MILES TIME #E | GH # hE: SH (F. e.e.) TEMP. 101 10M 10N BILLTY (Symbole) (Inches) (Knots) (True) (Miles) SEA LEVEL BUL B **BUL B** (True) Tentha Degree 3 29.94 32Ø 330 26 OVC 70 65 10 XÝ 340I 70 ٥, 3<u>3</u>2 1412 320 <u>6</u>8 29.93 5 335 26 OVC 69 62 10 0.2 10 320 0 68 32ø 0.3 3251 <u> 29.93</u> ഥ W OVC 6 62 315 5 8 Ĉu 315 340 BKN 29.94 68 51 68 0.4 24 14 Φ W 5 05 8 CU 315 68 315 355 BKN 29.95 60 13 8 13 lΦ 67 .5 29.96 38 CU 68 334 3**3**0 344 06 13 BKN 13 10 Cu 62 354 350 07 BKN 30,01 57 355 66 13 24 10 69 35W 3**5**7 0.0 345 34 14 BKN 30,02 67 58 20 14 350 10 340 BKN 30.02 <u>58</u> 345 100 09 W 15 20 15 58 3 344 10 0 BKN 30,02 5 < U 354 34W 1W 6-1 340 30.02 70 58 て ري 350 6 15 330 0 IW 350 C 340 <u>255</u> 64 BKV 30.01 70 12 14 90C 21 10 6 35c 325 <u>58</u> CL 320 4 BKM 3001 13 TCb 8 35<u>0</u> 380 14 30.01 69 58 Cu 63 *3*80 12 Set 10 \overline{C}_{ω} 2 340 344 29.99 (Ø 63 15 14 OVC 15 LΨ CS 345 345 30.00 68 oxxo 57 16 15 0 14 10 avc Cu 345 17 30.01 <u>68</u> 345 15 10 BKN DOXD 30.01 <u>6</u>8 345 BKU CO 15 10 18 (DZW 6 9 <u> 345</u> 14 67 33φ 3 BKN 30 U3 63 20 19 **O**UCE 100 74C 340 20 14 0 000 2 68 34C 54 34C 21 BKN 30.07 14 346 360 1*30 0*7 15 Ø 22 345 23 30.09 <u>34 S</u> 4 **S**CT CLR 30.09 15 000 14 10 60 24 Ø TO T 324 11. OPERATIONAL SUMMARY INITIALS TIME STATUS AT 0001 CHECK LIST DeF MATERIAL CONDITION 1230 OKE 1. Held quarters. READINESS CONDITION 0,461 2. Chronometer(s) wound. 030 IV BUF SUTATE JAMOITARED 1945 LPHA 3. Held evening reports. PAW 4. Magazines inspected. 0851 HMIO 4b. Minimum temperature: 4a. Maximum temperature: 85°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAIRING Began Ended IAW MACHINERY LOGS 1245 4000 06 GO ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES AN/485 - 27 XMPR URC-9 UNE ANDRN - 18 Auth. Attached Leave TAD Other On Board D-28 SUMPLISE \$551 SUM SE T 1819

TR.	PARTMEN Ansport S. Coast 4380B (Re	ATION GUARI	D		LO	G - WEA	THER OBS	ERVAT	HA HO	OPER	AHOITA	L SUM	MARY S	HEET	·	
	र काम							DAY		DATE		1	DESTINAT			
יט	sccc.	116	roRou:	s (w	Mec.	627)		TH	IRSDAY	(OZA	PR 517	+	5 K	MES		
							1. WEATH	ER OBSEI	RVATION	5						
			ESTI	INDS IF MATED				TEMPE (Deg	RATURE	£L.	CL QUES			SEA BAYES		#AYES_
TIME	WILES	1 CM TM3	OTRECY-	(Kno(s)	#151- #15177	BEATHER (Symbole)	1	DRY	VET	AMOUN.	***E	TEMP	. 10N	3	ION	NEI GHT (Foot)
 	14	-	 	100	(Miles)	Sut	SEA LEVEL	54	52	(Tentha)		63			350	3
0 2	14	8	028	08	10	Sct	30.08	59	5/	14	CU	65	02		350	3
03	15	2	070	00	10	BKN	34.07	58	54	6	CU	64			000	Z
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05	15	4	(THS	06	10	BKN	30.10	58	50	6	CU	164	04		Doct	3
06	16	100	JYW		14	OUL	3012	57	44	100	20	63	04		DID	2
07	15	1	DZU	5	111	BKN	3413	57	79	4	ICU	65	nu		DID	2
0.6	19	9	707	5	10	BKN	3015	56	50	9	Cu	64	-		320	2
09	14	9	190	6	10	BKN	30.16	59	5I	19	Cu	64			320	2
10	14	5	190	G	10	BKN	30.17	28	27	9	Cu	69	!		340	2
11	14	5	220	ક	10	BKN	30.16	63	53	ਿਲ	Cu	64	· [- -	310	2
12	14	3	220	10	149	BKN	30.14	65	55	9	Cu	64	224) 1	050	2
ני	15	9	230	13	14	BKN	30.12	65	55	8	Cu	64	220	D L	055	2
7.4	16	l	230	08	10	BKN	34.14	65	55	8	CU	64	215	1	Ø35	2
15	16	9	224	(4)	10	BKN	30:08	65	55	8	رح	166	1 220	1 6	عزه	2
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18	17	Y	225	17	10	BKN	3004	52	53	7	CU	64	234	1	020	2
19	16	છ	220	16	11	Si-	3464	61	53	5	رن	64	23		(b) 2(d)	2
20	_15_	Ø	220	23	10	S	30.05	41	54	3	Cu	64	2.3		232	Z
21	14	(g	216	20	W	Set	30.05	62	54	3	Cu	64	2 3		230	2
22	14	9	215	20	10	Set	30.05	62	54	3	Cu	64	23		230	2
23	13	2	228	18	10	SeI	30,00	62	22	3	Cu	64	190	2 1	140	2
24	13	1	225	14	10	Scr	30,06	55	51	2	Cu	146	J	L	140	2
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MACH I	ERY COR	TION	AND DISC	REPANCIES							DRILLS	AND TRA	INING		<u> </u>	
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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) VESSEL - 17271-8-DATE DAY +5 Kimez 3 APR 87 USCGC VIGOROUS (WMER 627 FRIDAY I. WEATHER OBSERVATIONS TINDS IF TEMPERATURE ESTIMATED CL DU D'S SEA BAYES (Degrees) CFA STEEL BAVES 2 INF MILES DI BECT. 73761 VISI. WEATHER BAROMETER DIRECT. 0 1 R 6 7 Y HEIGH! F 0 0 CH 811174 (Symbole) (Inches) **WE 1** AMQUN' 1 E WP. 104 (Knots) (True) (Miles) Ŧ True SEA LEVEL BUL B 8UL 8 Tentha) Degrees 225 Sct 52 43 13 Φ 10 30.00 54 دب 41 204 09 144 0 1 <u>50</u> 12 Set 30,06 ىت 140 6.2 (B5 48 204 45 2 0) 12 202 30,04 47 CU 41 200 ScT w 0 4 48 230 10 SCT 30.04 1 W 41 ZUW 19 45 05 Se 7 3/02 44 WID 22 WZU 1 W 47 4 74 434 0.6 2 025 10 567 16 3005 6, 03Ü C 36 42 COZO 3000 45 41 D20 3500 17 42 w CLR 08 46 AC 350 q 062 L8 10 BKW 34,08 42 4¢ Ø62 09 10 ModREC ---12 060 49 NSIDI NS MORED 08 30.03 50 100 13 14 1.5 MOOR ED 065 25 16 05 OYC 29.94 49 46 10 Ns 17 18 19 045 25 29,80 44 48 MUOR #13 20 buc 45 21 22 23 MOORED 090 08 OVC 29.76 5 2 08 53 NS 10 2 101 11. OPERATIONAL SUMMARY STATUS AT 0001 INITIALS CHECK LIST 11 M E MATERIAL COMBITION YOKE 90 DZ 1030 1. Held quarters. READINESS CONDITION Ger W 2. Chronometer(s) wound. 10-30 OPERATIONAL STATUS ıÆ ALPH4 3. Held evening reports. 1945 M12218H LE 1030 ひねて 4. Magazines inspected. 46. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING IAW MACHWERY LOGS Began Ended Type ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES W/ucons min 4RC-9 4HF 5 - 402N - 18 Auth. Attached Leave TAD Other On-Board D-30 SUN 81 ST 0547 SUNSET 1830

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U.S. COAST GUARD CG-43F0B (Rev. 3-67) VESSEL BRANCH DATE VIGUROUS (UMEC-627) - S4T TS ROMEO USCGC 04 APR 1487 1. WEATHER OBSERVATIONS - BINDS IF TEMPERATURE ESTIMATED (Degrees) CLOUES SEA SEA BAVES SEFLL BAVES 146 WILES FORCE -V151-BEATHER 5 BARDMETER BIRECT . DIRECT-# E: EE C BILLITY Simbole 10+ (Inches) ... WET AMOUR * TYPE 1 E WP . 100 (Knots (True) SEA LEVEL BUL B 801.8 (Tentha) Degrees) True True 0.7 0.3 53 29.55 51 EM5 MOORED 090 08 04 CVC/R 10 0.5 J 6 0,7 0.8 mue r ED 224 08 16 BKN 29.53 41 47 Ns 09 • 0 11 LO 44 200 23 29.54 499 200 40 OVC 190 ٠. 21 29.56 9 220 Lo KK 49 Cu 13 228 22 29.59 2 13 46 10 OVC 47 TE CU 228 2 Saa 14 410 14 210 24 29.62 42 14 170 La UVC 46 100 2 210 15 23 48 42 180 215 BKW 2462 9 ζ 10 215 BKN 250 21 TO150 17 15 215 22 D 46 230 181 18 27 720 BKN 29.69 Cu 2201 X2 45 170 19 10 2 29,70 45 41 210 227 BKN Cu 160 20 29,73 AC $T\Phi$ 8 218 10 <u>Sc.1</u> 318 180 40 2 21 17 11 218 LØ BKA 6 Ac 218 180 218 15 5 22 10 24.75 Ø 218 180 10 44 40 38 23 4 203 17 29.76 423 180 io 10 Ø Ż 5 LO 24 8 3.5 164 7476 60 191 64 11. OPERATIONAL SUMMARY STATUS AT GOO! CHECK LIST TIME INITIALS YOKE MATERIAL COMOLITION WS 0915 i. Held quarters. READINESS CONDITION 工 1150 BCK-2. Chronometer(s) wound. OPERATIONAL STATUS BRAUO - 6 1945 BeF 3. Held evening reports. NO 122 1M 1252 4. Magazines inspected. 4a. Maximum temperature: 4b. Minimum temperature: 71 42 MACHINERY CONDITION AND BISCREPANCIES DRILLS AND TRAINING PHACHE MACHINERY Began Ended Type LOGS 0940 0125 ABANDON SHIP 1320 1357 FIRE GE-GALLGY ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES W5-23 roll Mc-9 SOEN -18 Auth. Attached TAD Other On Board Leave D-31. Sum e I SE Ø545 SUM SET 1827

DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U.S. COAST CHARD MOTENT STATE DAY USCG 627 1. WEATHER OBSERVATIONS WINDS IF TEMPERATURE ESTIMATED CL OUCS SEA WAVES SEA SWELL WAVES (Degrees) = TIME BILES WISI. THE ATHER DIRECTA BACOMETER BATER DIRECT. 3 Feet) 10M (Inches) AMDUR" 1 E we 104 (Knots) 1 D N (True) (Miles) SEA LEVEL BUL B SUL & Dogroo True) 130 29 3 Lυ L7¢ 7 CI 0 7 L30 29.77 ζ L LT 130 QUE 0.3 VANCED BEC HIZ 4 3 LO 0.5 3 تغ CI 35 36 1 1 74 06 Cu 30 90 أحج. 41 0 ا 07 36 10 10 OVC a n 4 130 35 5 29,82 41 10 ΙŒ SCT Ac./c 130 4 09 13 8 50r 29.82 ALICI 123 10 42 3 35 110 6 5 9 10 5 29.82 13 2 153 10 43 35 1300 BKN AC/c 11 14 4 9 060 10 29,83 5 BKN 43 Ac/c 35 120 7 12 /8क 1608 35 4 6 BKN 29.82 45 8 C1 140 13 34 14 03O 29.81 11 000 47 45 4 130 040 34 WL W 15 **(7)** 7978 48 46 61 024 22 024 125 15 BKN 2976 フ OZW 34 24 47 45 41 024 2 5 120 29,76 47 94 7 34 14 015 16 2 020 010 SI 29.75 17 **Ø**35 34 43 220 010 0VC 10 2. 18 ш 0 スノス 08 0.1 lovc. 29.75 43 42 10 57 000 Z 3 320 42 14 19 @10 Ø. 1 79.75 220 43 $\mathsf{L}\mathsf{C}$ ᢓ᠆ 020 29.75 34 20 $\Phi57$ Ø.2 42 37 10 **5**T Ø57 100 5 21 ନ 8 @3@ 42 41 I a 34 5 29.76 5.4 430 LIØ CXY F 020 29.76 4 22 42 42 10 341 ŵΖœ ПO Ø Ø.L OVC/F 51 23 7 6 29,75 34 010 Ø.1 42 10 9 OVC/F 43 ST Ø10 110 7 6 24 O. 1 FIR 29.74 42 42 DID TOT 4 11. OPERATIONAL SUMMARY STATUS AT DOOL CHECK LIST TIME INITIALS MATERIAL COMDITION بحجا OKE 600 1. Held quarters. READINESS CONDITION 2. Chronometer(s) wound. 023 OPERATIONAL STATUS 1945 BLPILA 3. Held evening reports. MISSION 0920 FILHERIES 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: F 6 MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Began Ended Type LOGS ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES W/405-23 4RC-9 50N-18 Auth. D - 32Attached Leave TAD Other On Board SUMBISE d634 SUNSCT. 1822 1913

DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) VE 2 3 EL 23 4 10 2 2 3 V ZONE DESTINAT TH DAY DATE VIGOROUS USCGC WMEC -627 M30.234 +4 WILLIE 6 192 87 1. WEATHER OBSERVATIONS WINDS IF ESTIMATED (Degrees) CLOUGS SEA SEA WAYES SWELL WAVES FORCE MILES arnect. WEATHER BAROMETER WATER DIRECT. TIME 4151. DIRECT-Ē Feet) 10N BILITY 084 WET AMOUR " TYPE TENP. ION (Symbole) (Inches) (Knots) (True) (Miles) True SEA LEVEL BULB BUL B Tenth, Degress) True 34 3 11 F 2972 42 0 OTO 42 WIL 110 2968 WW 0 2 W15 10 41 41 0 Z 110 36 2966 0.3 10 41 41 0 010 2. **O**1(*b*) (0) 0.4 0.4 35 F/OVC 29.64 43 42 030 2 ප 20 0.1 110 063 VC Ø 0.5 21 Flore 29.64 10 35 080 2 Ø 103 O. 42 5-050 0-1.9F/OVC 29.65 2 06 070 42 10 57 35 070 1 040 20 42 07 9 29.68 2 130 F/OVC 3 42 41 LO <u>3</u>5 060 070 Sc 0.6 29.69 Sc 3 R/ovc 10 35 050 LIGHT & VACAGE 5 42 41 5 09 10 14 29.65 35 Ø60 2 42 41 **Ø37 037** 17 R/OVC Sc 10 35 067 3 29.67 43 42 Sc. 055 2 14 Ø67 10 040 lo 11 29,68 43 085 630 13 5८ 35 Ø30 10 OVC TO 12 43 マ **440** フ OVC 7968 44 50 35 10 DYO 10 + 3 F/12 Ø) O フ 34 4 034 21 74 43 O3W 43 14 7 Q34 フ F/IZ 24.68 43 Ü 35 44 W34 15 FIR 29.68 42 Du 2000 Ü 43 36 40 TZO 291 ک 2 00 11 Q BKN 29.67 42 چر 36 700 17 2 210 8 42 210 190 12 2 <u>پ ر</u> OVC 29.67 41 10 2 8 18 210 F/R 0 35 200 1 180 29.67 42 41 Z 34í 19 8 186 14 4 29.65 41 10 51. 35 1342 ovc 180 44 260 20 260 16 2 10 160 ovc/F129,64 40 39 9 51 34 5 277 21 17 3 ovc/F/29,65 39 34 140 3 40 ĺØ ST 277 16 2 270 34 270 22 j4 8 29.64 39 ST 1 220 I 40 10 016 23 25F, 255 ST 34 14 Ø 19 1ø 29.63 41 39 10 2 240 4 OVC 274 Ø SCT 29,58 36 240 74 39 2 cu 270 101 206 11. OPERATIONAL SUMMARY STATUS AT 0001 CHECK LIST TIME INITEALS MATERIAL CONDITION YOKE تحق 1230 l. Held quarters. READINESS CONDITION IV 2. Chronometer(s) wound. 1108 OPERATIONAL STATUS 1745 ALPHA 2 3. Held evening reports. MISSION 0842 4. Magazines inspected. نسادالير FISHFRIES 64°F 4b. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLE AND TRAINING MACHINERY Ended IAW LOGS Began Type TOWER ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES xxxX URC-9 unt SON-18 Auth. Attached Leave TAD Other One Board D - 33SUN 81 SE 0622 1915 BRAFT: FUB AFT

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U.S. COAST GUARD CG-4340B (Rev. 3-67) VESSEL STREET DATE WMBC - 627 +4 QUZBIZG VIGORAS 7 APR 87 uscg < TURSOMY I. WEATHER OBSERVATIONS U DINDS IF TEMPERATURE ESTIMATED CLOUCS SEA SEA BAYES SWELL WAVES (Degrees) £ MILES DIRECT. FORCE WATER DIRECT-DIRECT. V151 -WEATHER IME BAROMFTER 3 Feet) 1 4 P E 104 AMOUNT. TEMP. 104 10* Symbole (Inches) (Knots) Ę (True (Miles) SEA LEVEL BUL D (True) 817. 8 Tentha) Degresal True <u> 39</u> 29.58 36 240 3 6 260 CLR 260 16 10 Ø 0 10 4 CU 34 270 2 245 258 13 CLR 29.57 7 0.2 l Ø 11 Ø 255 245 57X ØVC 29.57 IØ 0.3 10 254 6 10 750 0.4 257 LØ BKN 29.54 39 230 2 40 8 0 29.56 Ò: 2 40 **2.3**じ 200 10 ے بی 39 10 34 255 0 11 230 2 06 10 OVC 29.SS 40 39 TU 34 10 3 760 125 07 230 4 22.95 40 39 260 10 کرہ 4 14 ۷SS 12 34 0.8 29.56 225 255 15 547 41 40 3 AC 225 LΦ 40 7 3 09 3 Lo 19.55 41 AC 230 Ø60 23ø 34 2 8 14 BKN 29.55 Ø7@ t Q 2 3 Jø 100 Set 42 40 4 AL 37 2300 3 3 230 11 8 19 ScT 29,53 42 3 AC 37 225 060 3 4 225 LΦ 40 54/4/24,53 160 47 12 9 44 13 160 AC 36 Des. 36 13 10 /H 29.52 47 44 4 170 3 8 Sct. 210 ナト 160 190 4 r ۸c 36 7 2 2 جا tô 71,50 44 140 **XF** 15 35 160 79.50 47 44 \sim \cdot 050 10 160 9 36 185 8 29.49 085 AC 6 185 BKN/H 42 14 36 170 3 3 170 OVC 29.48 42 10 AC 220 4 41 2 18 6 OVC/R 29,48 Sc 34 160 2 230 4 160 13 41 LØ 41 23 Ø 19 Ø 17a 100 4.5 10V4R 29.48 41 40 lø 50 36 170 20 23<u>0</u> 5.1 34 230 250 3 3 014/2 29.47 41 41 10 50 21 34 248 248 41 269 20 **5**4 22 39 769 3 100 40 SC 250 23 39 264 29.56 40 50 34 264 250 10 d P. O orc ح2ن 5 34 24 10 0 260 10 BKr 2953 40 16 260 TO T 208 11. OPERATIONAL SUMMARY STATUS AT GOOT INITIALS CHECK LIST TIME MATERIAL CONDITION PACU YOKE 1225 1. Held quarters. READINESS CONDITION J114 \subset III 2. Chronometer(s) wound. OPERATIONAL STATUS 1945 PAW ALPHA 3. Held evening reports. N01221W PISHBRIFS 4. Magazines inspected. 1003 4b. Minimum temperature: 4a. Maximum temperature: 63°F 43°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING MACHWERY Began Ended Type IAW 1065 1630 12300 G2.(Q Convert PYRO TRAINING 1900 1950 ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES ANJURY - 72 KMPR WE-9 UNF 50N - 18 Auth. Attached Legve TAD Other On Board SUMBISE OGO D - 341907 SUNSET

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) VESSEL STATEON ZONE DESTINATE 13 SIH 3 ۲۰۰۴ (درزی: د USCGC VIGORAS CHIEC (GZ7) WEDLEIDMY 1. WEATHER OBSERVATIONS WINGS IF TEMPERATURE ESTEMATED. SEA BAVES (Degrees) croucs. SWELL WAVES = MILES BIREET-3 FORCE V151-TIME WEATHER BAROMETER WATER DIRECT. HE (GH T (Foot) IRECT. hE1 GH ((Feet) BILLTY ION ... AMOUM " T Y P ; 1 6 80 (Knors) Symbole (Inches) ... 1 0 m 10 % (True) (Miles) SEA LEVEL But 8 (True) Bin R Tentha Degree 10 0 2/00 W BKNI 29.52 \overline{a} 260 250 W 4-1 40 a 0 2 12 10 41 S 2021 255 BKN 250 40 03 ove 29.50 37 520 267 12 LO 42 40 1 ټو ट्य 0 4 40 34 250 233 SC/A 20 10 0/c 29,48 37 10 233 2 05 34 226 10 40 38 10 ∽ 226 2.50 6 OVC 29,48 3 9 06 3 40 39 250 169 10 29,49 ovc 10 50 34 4 07 9 150 34 .3 40 40 240 4 OVC/F 29.50 ĺØ SC 08 4 160 FlR Ø 34 140 ,3 40 24.50 160 40 0.9 ح 56 240 42 41 35 90 24.51 I W 10 36 320 324 40 39 10 SC Me 3 29.59 2_ 3 40 39 10 190 340 1D 29.54 36 340 12 S 355 29.54 35 12 40 36 So. 3 OVC TQ) 080 4 0 010 19.53 39 39 36 15 35O TO 050 SVC 14 39 39 29,53 35 35₽ 010 15 O VC ପର୍ଚ୍ଚ ପ LC 7 15 G OVC 39 015 19.54 3 20 340 5 35 937 340 16 2 Ø 000 16 OVC 29.55 39 37 上卤 35 646 2 17 ন্ত 7 <u>340</u> 20 29.55 39 10 35 2 330 3 OVC 40 50 18 **L3** 322 39 <u>3</u> C 2 11 330 29.57 10 32Z Ø OVC 40 Sc. 2954 340 9 2 ΙØ 37 36 19 BKN 39 ےک 340 905 4 7 36 ح د 20 24ø 8 31 260 DVC 605 la 21 310 8 29 6 ک 50 36 ∞ 39 37 10 045 260 295 8 ٥٧د 29.62 34 LU 50 36 37 2/10 045 22 23 39 0 1295 OVC Z962 37 LØ 50 350 Lυ 250 Z 10 29.59 305 39 5 OVC/L 38 T 340 Ns 330 ٧ 191 11. OPERATIONAL SUMMARY STATUS AT DOO! CHECK LIST TIME INITIALS MATERIAL COMPLICA YOKE 1300 بمصد i. Held augrters. READINESS CONDITION 0925 PHW 叹 2. Chronometer(s) wound. OPERATIONAL STATUS ALPHA 1445 PAW 3. Held evening reports. MISSION PHW 0944 TISHEZIES 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 61°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING 1th MACHINERY Began Ended Type 200. 1358 P-250 TRAINING 33 GWMEX ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES W/ulr-23 XATE URC-9 4NF SON-18 Auth. Attached Leave TAD On Board D - 35Bun Ri SE 0559 SUN SET

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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET IL S. COAST GUARD CG-4380B (Rev 3-67) 9 AARET + 4 GLEUEL HURSDAY VIGGERS (LIMER 627) USCG C 1. WEATHER OBSERVATIONS UNINOS IF TEMPERATURE ESTIMATED CLOUCS (Dedress) SEA SEA RAVES SHELL WAVES = DIRECT-FORCE MILES 15: TIME ¥151-WEATHER GARDMETER BATER DIRECT-DIRECT. 1 64 LON AMOUN! TEMP. 104 (Knots) (Symbole) (Inches) (True) (Miles) Tentha) SEA LEVEL 8UL 8 True) Degree OVC/L 79.57 4439 36 Ns 35 290 246 _L 290 10 0.1 9 29.55 35 38 10 0 2 32.O ovc 38 300 3*00* 0.1 9 310 20 10 OVC 29.56 38 37 10) 35 300 30cd 04 325 BKN 29, 55 325 300 10 18 10 38 36 6 Sc 35 3 2 05 0 2 Oc/2 29.59 37 320 10 35 1Ø **5**८ 3.5 320 310 20 4 06 ovc 29.61 17 Jφ 36 10 3øn 38 5 C 36 300 310 l 4 0.7 9 29.63 16 35 320 320 35 300 4 BKN <u> 37</u> S C 0.8 9 Ø 4 284 19 Ld BKN 29.63 40 39 64 35 305 30d 09 8 741 3 29.63 40 300 10 3<u>5</u> ጋ 292 BKN 42 CLI 10 5 Ļ AC 35 3 245 12 10 BKN 29.64 40 290 300 42 - j-2 11 RS 292 1 ¢ 7 35 290 3 15 BKN 39. 64 43 41 04 300 ى. 15.4 9 790 1.2 327 BKH 129.64 45 41 3*5* L $3\omega_{\Omega}$ ΙØ 9 13 2 45 4 (300 325 20 10 BKM 29.62 35 290 3 __ 40 14 10 Σ્ 34 290 4 30d 300 10 OUC 29.63 (3 15 (7) صد 39 35 UVC 29.64 41 LO 310 350 310 15 33ø Sc 16 **(**) <u>330</u> 16 10 BKN 29.64 40 38 6 35 330 17 300 13 40 3 305 29,64 38 CY/AC 35 ΙØ SCT 300 39 18 3 Ī 14 280 SCT 27.64 42 ci/cz 35 33¢ 4 10 300 Ø LL 300 2 3*0*0 10 Sit 37 5 300 1 29.67 40 Sc 35 3005 310 20 q 300 10 10 ax 2467 400 31 Ø SC 35 2 21 DO B 304 8 10 OVL 40 38 35 \$2b 24.69 310 Z N 8 8 P **3/**C 39 35 292 Z9, LD 37 Z 54 3,0 327 23 9 N S VO 35 0 57 239 WL. 29,48 39 56 34 2 340 162 OVC 29.69 8 74 10 41 Ø 280 2 SC 280 101 11. OPERATIONAL SUMMARY STATUS AT 0001 CHECK LIST INITIALS MATERIAL CONDITION 1335 BeF YONE 1. Held quarters. READINESS CONDITION PAU 2. Chronometer(s) wound. 1000 GPERATIONAL STATUS ALPHA PAW 1445 3. Held evening reports. LOMESTIC FISHERIES 4. Magazines inspected. IWZU PAW 4b. Minimum temperature: 4a. Maximum temperature: 61 F 475 MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended 1AW MACHINERY Began Type Lous 12.35 1205 BOAT LONEL 124. NINC ی سر ر । 355 LECTRE. 134n PROTECTIVECLOTHING 1502 1900 RUBBER Dork, NC ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES AN/4RG -23 XMTR urc-9 we 50N-18 Auth. Attached Leave TAD Other On Board D-36 SUMBISE (100L) SUNSET 1900

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET S COAST GUARD CG-4380B | Rev 3-671 METERIA 31553A IN April El triony USCG C VIGGIZING (WINEC GZ) 1. WEATHER OBSERVATIONS - BINDS IF TEMPERATURE CLOUCS SEA SEA WAVES SWELL WAVES ESTIMATEO (Degrees) WATER DIRECT-DIRECT-MILES DIRECT-TORCE *151-PEATHER BARDMETER 3 HE1 GH 1 WET AMOUN' TYPE 1 F M P 10* 101 (Inches) 104 (Symbole) (Knett. (Miles) BUL B (True) ISEA LEVEL **BUL 8** Degrees True 290 290 *ا فا*.ات 0 290 Le 0 1 29<u>0</u> 39 35 290 29.68 2 10 کد 0 2 41 10 Û 312 5 290 29.68 290 0) 35 7 321 JO BKN 41 10 2 **270** 0.4 35 272 272 TO BKN 38 کر 29.65 41 IO 35 277 2 0.5 270 277 OUC 29.66 42 40 2 12 70 10 11 32 326 SSS Z 06 324 29.67 42 40 B 40 BKN 10 07 2 35 290 52.0 29.69 42 11 273 To 10 10 0 35 270 ٠٧ eσ 1 0.8 29.72 49 42 270 70 CLR 35 -270 270 1 79.71 42 ,5 09 CLR Ø 276 12 29.71 44 35 270 5 270 \perp 10 CLK 46 4 Ø 6 10 0 310 C 3 11 2970 35 १२० 270 5 10 Set. ٠5 300 12 3 29.69 Ci 35 てりい 270 40 45 12 10 LO 4 35 27 d 29 48 13 760 LØ ્રહ 35 275 4 48 44 Ci 8 P **Z**55 D 29.69 47 3 رے 35 260 12 10 29.69 50 212 5 15 0 212 SCT 51 4 210 -د ، 27 C 16 6 1) 10 29.67 47 710 SCI 33 17 10 46 710 17 7 200 10 CLR 29.67 <u>50</u> 0 5 274 43 18 9 170 ४ CLR 45 Ø 210 14 10 29.67 45 ewi 2667 43 35 194 ID 14 LLR Ö 29.69 20 <u>250</u> 10 35 2**5**0 هد CL7/129.69 0 35 250 7 446 47 21 250 L+0 14 20 \Box 35 29.70 250 CLR 22:0 22 34 32 250 23 حيد 29.71 46 43 250 10 10 5 44 43 35 215 1 29.71 Ø 179 LO Ø 215 14 10 CLR tg t 249 11. OPERATIONAL SUMMARY INITIALS STATUS AT GOOT CHECK LIST MATERIAL COMDITION BC5= 1230 4014 1. Held quarters. READINESS CONDITION 2. Chronometer(s) wound. BeF TV OPERATIONAL STATUS ALPHA 3. Held evening reports. MISSION ritu 4. Magazines inspected. 1054 TISHERIES 4a. Maximum temperature: 4b. Minimum temperature: 66°F 37°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Began Ended Type IRW MACION -527 ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES AN/WRT-23 KANK URC- 9 WHF DW-18 Other On-Board Auth. Attached Leave TAD D-37 SUMMISE SLOW SUMBET

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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) VESSEL STATION t4 GUEISSC 2 APR 81 VIGURUS WMEET 627 USCGC 2000 I. WEATHER OBSERVATIONS TINDS IF TEMPERATURE CLOUES \$EA SWELL WAVES BETIMATED (Descent) DIRECT-146 MILES F0 0 C VISI-BEATHER GARDMETER WATER DIRECT. 3 NE 1 GM F (F 0 0 t) AMOUNT TYPE TEMP. 10N 101 100 (Knots) (Symbole) (Inches) (True) (Miles) SEA LEVEL BUL S 8 J.) 8 (Tentha) Degrees) 0 : 0 2 0.1 29 52 10 47 MODINED 224 0 0.5 06 67 0.8 2982 55 52 2 MICO hed zza 09 10 Cu Set 29.81 <u>55</u> 240 10 43 29.81 Cu 51 1.2 Set 240 10 _ ~ _ 3 ٠ 5 29.81 69 26 055 13 LIGHT & WALKSON 10 5CT 155 1.4 7 29.80 69 cu/ci Varingu SCT LOW 155 1 15 6 8 56 cu/ci € Ø 100 5ct/H 29.80 63 5 8 144 .5 63 3 130 lo Sct 29.89 56 52 29.8L 100 ٠ ٢ ~ 17 090 8 BKN 57 8 Cu رح 140 SCT 53 2983 W&a IO NCH 250 29.84 090 ٠. 10 40 19 0 0 620 BKN _ _ 090 BKN 29.85 49 47 20 5 70 12 012 020 73.85 35 47 21 10 BKN 44 10 646 11 29.86 C50 050 1 40 45 22 OVC 020 23 060 8 080 OVC/F 44 43 10 060 3 43 Ø80 24 080 OV-/F 27,88 43 56 080 5 5 60 101 11. OPERATIONAL SUMMARY INITIALS TIME STATUS AT GOOL CHECK LIST MATERIAL CONDITION Be= 1600 YOKE 1. Held quarters. READINESS CONDITION Ber∕ 1136 2. Chronometer(s) wound. OPERATIONAL STATUS BeE 945 3. Held evening reports. BCF DOMESTIC 4. Magazines inspected. TIS HERIES 4b. Minimum temperature: 4a. Maximum temperature: 67 42 MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING IAW MACHINERY LOCK Began Ended Type PRECISION ASCHORICK ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES M/485-23 XATR ure-9 uns Sov-18 Other On Board TAD Auth. Attached Leave D - 39SUNRISE 960z 920

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U.S. COAST GUARD CG-43NOB (Rev 3-67 VESSEE SEEFER DAY ISAPR87 MONDAY QUEBEC WMEC J. GOROUS USCGC 1. WEATHER OBSERVATIONS TINOS IF TEMPERATURE CLOUDS SEA SEA WAVES SWELL WAVES FSTIMATED (Descees) DIRECT-Ξ WATER DIRECT FORCE ¥151-WEATHER BAROMETER 1 **M** E MILES F. 681 3 AMOUR * TYPE TEWP. 10H 108 104 (Symbole) (Inches) ĭ (Ine) (Miles) BUL B 801.8 Tentha, Degrees True. True SEA LEVEL 36 29,89 41 10 Sc Q6Q 040 42 \$ 060 Ove/F \$65 36 2 045 4 42 41 മ Sc 0 2 8 26 29.88 065 OVC/F 3 32 Ø58 2 03 6 5 29.87 41 40 ΙΦ <u>3c</u> 060 Ø5B 25 bvc 5 32 0.4 50 045 5 (060) 2 10 29.86 10 26 ay L **9**45 05 පි 54 35 040 5 045 41 40 23 10 9 130 0 VC 29 8.6 41 35 7 OVE/R 29.88 40 Ø45 3 06 35 2 10 ے ک 050 9 220 35 07 2 OULR 29.39 40 39 56 \$5 ¢ 045 3 28 000 10 Ns 35 4 060 0.8 29.88 40 40 10 USO 038 25 OVC/R 35 060 10 09 6 5 37 29.83 40 31 NS 050 350 29.83 40 10 34 (40 4 050 5 40 UVC/R 10 1150 L 40 **~**5 Ø 050 3 40 050 OVCIL 79 83 11 39 40 10 NS 050 31 29.83 105 050 3 050 10 12 V40 40 ked 34 3 2 39 13 045 29.86 945 040 Ovc/R 40 10 N5 34 14 39 040 2 29.87 38 Ø 34 3 040 32 N5 040 ovc/R 15 N 5 35 29.94 38 36 74 940 MO 025 10 KHURED ouc)R OVC/R/79.93 35 38 38 ら 34 040 040 2 LØ 040 030 N 5 34 035 29.96 38 38 15 32 **935** 2 2:18 29.79 33 115 34 Q 34 Q35 38 10 035 32 34 39 030 Z love/R130.01 39 رزم 40 ユ٥ 040 130 19 Ancrolies 840 34 2 20 0.35 33 30,05 39 37 ΙØ N 5 035 3 040 OVC/R 34 3 4 38 040 29 30,08 40 IØ ۷ $\varphi 3 \varphi$ NS **430** OVC/R ANCHORED 35 37 3 940 2 10 NS 26 4 OVC/R 30.10 40 Ø30 030 22 Ø35 2 23 5 30,12 36 Ø30 3 27 40 35 φ25 10 NS 38 3 10 37 Avuoken 101 11. OPERATIONAL SUMMARY CHECK LIST TIME INITIALS STATUS AT 0001 1300 MATERIAL COMDITION BLF OKE 1. Held quarters. READINESS CONDITION W 2. Chronometer(s) wound. 1130 QCF OPERATIONAL STATUS 1945 Bes ALPHA 3. Held evening reports. MD1221W 08 12 BEF DOMESTIC FISHERIES 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 65°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended Type Beam IAW MACHINERY 1318 1400 GE-COLLISION ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES w/425-23 XON URC-9 4NF 50 - 18 Other On-Board Auth. Attached Leave TAD D - 40SURAL SE WS40 SUNSET. 1909

TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET S. COAST GUARD CG-4380B (Rev. 3-67) TERRITOR OF THE STATE 3116 ZONE DESTINAT '. + CICLERIST C uscg 👝 14 mm 21 6 oreins WIMEC 621 1. WEATHER OBSERVATIONS UINDS IF TEMPERATURE au au e s (Degrees) C F A SEA BAVES ZHELL HAVES SE SE TIME MILES DIECT. F3 8 C F +121¥ WEATHER BAROMETER WATER DIAFCY. DIRECT C ... 5 6 ION BILITY WET AMOUN " TEWP. 1 0 H 104 (Knots: Symbola (inches) (True) # 6 (Miles) SEA LEVEL BUL B Degrees) BUL 8 Tentha) True) True) 37 35 38 10 41 ر ن **D35** ANCHURCO 035 BKN 30 001 6 01 30:00 0 2 BKIV 6 3 ANCHURED U 35 42 10 3 7 (U 435 41 30.00 03 ر ن 3 3 7 4 27 ANCHURRA 62 E 10 BKIN 40 **U35** _ 39 37 04 040 ANCHORED 30.12 رں BHN 000 10 05 3 Cu 3 37 35 030 38 045 م)_2 10 30.15 <u>Su-</u> 36 0.6 ጓ 24 2 _ 1720 CU 2 & 020 Lο 50 T 30,12 38 07 35 37 025 2 _ 035 23 مد 30.23 5٠ 33 BKM Awam ES. 08 35 10 50 35 025 __ Ø 023 18 10 OVC 37 5 34:22 09 8 SC 35 3 6 S 24 10 BKN 40 37 **035** OZO Ø 035 30,23 10 \mathcal{E} 35 8 35 030 9 030 22 BKN 36 50 3 7 10 30,22 030 11 9 ĝ SC. 20 10 RKN 30,21 37 35 35 620 OSW WZW 12 8 35 ara 56 36 031 17 10 BKN 30021 37 (1)7 (L 10 034 18 6 4 9 LO 4 30019 35 37 **02**മ ധടവ lw BKN 39 14 39 35 37 ς_{I} 6 18 (0) BKN 3449 6 ے د 220 3 Q34 LØ **034** 39 15 7 020 10 BKN 3017 27 50 35 020 Q30 356 10 39 37 040 16 20 30.15 35 020 BKN کر 17 О 358 23 38 10 30.13 40 2 36 040 Set کد 030 18 42 40 0 8 10 35 5 84 CLR 30.13 CLR **4**3ø 040 9 35 19 19 3 090 006 70 کیت 30.13 42 40 2 240 کر∓ 20 Š 2 35 050 8 17 10 **Ø**Ø3 003 SCT 37 AC 3ø,13 40 21 7 7 000 17 3 050 8 10 40 38 35 000 SCT 30.13 AC 35 9 10 7 ϕ 3 ϕ 30,12 37 AC 355 Z 22 355 BKN 41 23 8 7 5 17 39 35 2 Ø3Ø LO BKN 005 30.12 AC 005 32 lα W Q15 39 OSO W34 フ 16 SCT 30,12 10 ז מו 15 11, OPERATIONAL SUMMARY STATUS AT GOOL CHECK LIST INITIALS MATERIAL COMPLICA YOKE 4776 1225 1. Held quarters. READINESS CONDITION G_{m} 1113 W 2. Chronometer(s) wound. OPERATIONAL STATUS 1947 ALPHA 3. Held evening reports. MAISSIM FISHERIES 4. Magazines inspected. 0836 4a. Maximum temperature: 4b. Minimum temperature: 63°F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended IAW MACHINERY LOGI Began Type 1240 DC POS - RADIAC 1320 ELECTRONIC/COMMUNICATION COMBITION AND DISCREPANCIES W/Wr-23 xam URC-9 LUF 50N-18 Attached TAD Other On-Board Auth. Leave D-41SUNFISE 0403 SUNSET 1911

DEPARTMENT OF

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev. 3-67) ZONE DESTINATION METERY 2 JE23 15APREST ty QUEBEC USCGC VIGOROUS WMEC 627 SAPR87 1. WEATHER OBSERVATIONS UNDS IF TEMPERATURE (Degrees) CLOUCS SEA BAVES SWELL WAVES ESTIMATED E -DIRECT DIRECT 1 GN 1 BIRECY-Falce W151. WEATHER BAROMETER MILES 3 : ... AMOUN! TYPE TEWP. 104 IDN ION (Symbole) (Inches) (Knots) (True) (Miles) SEA LEVEL BUL 9 BUL B Degree 41 AC 32 ٥٠ 0 39 050 SCT 3010 10 SSC 13 41 AC 33 0 40 39 0 2 14.5 SCT 3609 (D) (d) 2 9 161Z 10 38 52 3009 Ø 33 **BIO ø3**ø 0.3 Ø (Ø 10 CLTZ 16 41 39 Ø et. 33 Ø0'0 Ø3Ø 4 30.10 CLR ග්රාර ١Ø 0.5 ø 2 4 CLR 34 000 Ø30 30.10 39 10 10 358 34 020 050 4 06 41 .39 ScT 30.09 204 18 10 Z. 030 4 34 2 0.7 40 S-7 30. TI 41 35 2 010 UÜÜ C 10 8 5 35 000 **050** O.B 16 42 40 <u>د/c.</u> SCT 10 30, 11 8 Ø 000 2 050 ဥ 42 54 35 POO 4 000 17 LØ OVC 30.12 40 Ιø 6 42 40 50 35 2 7 3012 000 O55 10 9 2 **400 15** 10 10 OVC 42 35 7 050 11 005 10 2 15 10 OVC 30,12 40 10 SC 005 6 Ø40 1.2 43 5< DV 5 2 30,11 10 W15 16 iw OUL 11 10 5 44 34 DLO 975 13 OVC 42 56 00 30.11 10 14 8 10 SC 34 06 G **1**30 16 43 624 ÍΦ 3409 46 0VC 35 15 2 4 43 16 50 020 060 47 \$3ci 18 10 64:1 3W10 33 4 630 14 3007 41 4ø 14 Sc. Ø2 S 060 4 OVC 36 34 025 5 OVL 4 17 4 15 30.09 40 10 03 600° 035 040 40 ST 34 TØ 630 2 030 17 3 OVC 30.07 40 51 35 630 OH Ø 4 Ü 4*0* 10 19 15 3 030 ouc 30.00 B 030 Ø 033 2 5 40 ST 8 3 30.0 41 35 **Ø33** 78 OVC 42 35 065 2 **03**0 OVC/E 21 LL 5 065 22 30.09 41 10 ST 2 41 **Q30** 5 42 La **055** 22 11 6 055 15 OUC/F 30.10 55 34 IØ 35 23 9 30.10 42 57 Ø30 4 015 **075** 13 Ove./f 42 O31. 2 4 D 065 bul F 30.11 42 42 lω 36 065 101 124 11. OPERATIONAL SUMMARY STATUS AT GOO! CHECK LIST TIME INITIALS P,4W MATERIAL COMPLITION 1225 YOKE 1. Held quarters. READINESS CONDITION 1107 W 2. Chronometer(s) wound. BAW 19485 OPERATIONAL STATUS ALPHA 3. Held evening reports. MO1221M Ø835 4. Magazines inspected. FISHERIES 4b. Minimum temperature: 37 *f* 4a. Maximum temperature: 64 F MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Ended Type MATCHINERY LOGS Began 1311 GO 50 ance 1521 1740 50 CAL GUNEK 12.08 ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES URT-73 XATK 4RC-9 LINE SQN-18 Other On- Board Attached Auth. Leave TAD D-42 SOS DELLERORS SURSET 1908

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-4380B (Rev 3-67) ZONE DESTINATION DATE VESSEL EXISTE VIGICROUS WMEC-627 THURENDAY 16 APRE ? ty QUEBEC USCGC I. WEATHER OBSERVATIONS MINOZ IL TEMPERATURE SEA BAVES DETAMITES (Degrees) CLOUDS SEA SWELL WAVES FORCE WATER DIRECT. 13 DIRECT-DIRECT-BEATHER MILES TIME HEIGHT (Feet) TEMP. 1 0 N AMOUN " ION 108 (Inches) (Knots) (True) (Miles) SEA LEVEL BUL B Tenthe Degree True) True 034 ż 42 51 35 054 41 10 3010 こいして 0 1 10 Ø5 # 35 4 Ø55 Ø36 42 41 10 ST 0 2 855 30.09 1.3 CVLIA 35 4 060 0.3 14 3 43 42 57 030 8 3007 060 out/A 3 04 35 060 OFO 30,09 2 8 42 41 W 9 20 WC 060 05 000 040 000 LO 3 S 18 30.OG 42 1260 30. Ja 35 040 OFE OVU 42 W 5= 06 18 w74 41 40 240 07 30.12 41 10 SZ 0v0 ·Z 20 34 076 OK 2 **Ø75** 4 0.8 9 080 37 10 ST 34 680 19 40 8 OVC/F 30.13 086 35 U.E.U OK/F 30.11 09 40 40 ID STĺØ 7350 254 2 10 10 1 OV/F 30 11 40 40 10 57 35 060 4 <u>35</u> **16**0 57 11 9 2 10 6 13 OK/F 3011 41 40 150 1867 411 10 1.7 **654** ar/F 13011 57 35 254 Our/F/K 3010 57 13 41 10 35 3 41 650 050 12 T over 30.09 25 2 41 10 060 14 41 ese ප 076 16 OK/F 30.11 070 35 15 อ 1868 40 40 10 ST 050 1 10 OVC/F 30.06 ST 35 356 1 000 3 8 8 41 10 356 12 40 16 020 1 63c 3 17 8 10 4 40 40 ST 35 byc/F 30.06 10 020 **Ø**35 035 13 4 1 57 35 2 18 oux 30.02 41 ΤΦ Ø35 6 0 35 over 30.03 41 41 هد ST 076 8 .5 19 5 1 40 51 35 ove/ 30.01 Τø **Ø40** 20 8 14 40 040 . 7 21 41 14 57 36 040 XXAK30,00 0 044 41 36 w 040 060 15 0 OUL FRE BUD (C) CD 42 ST 22 ഗ3ഗ 2 23 CULPIR 29.98 42 57 35 86 B 15 42 10 030 030 13 ouc/F/R 29.45 050 42 42 57 20 101 219 11. OPERATIONAL SUMMARY TIME INITIALS STATUS AT GOO! CHECK LIST 1225 MATERIAL COMOLITION PAW YOKE 1. Held quarters. READINESS CONDITION 1108 Ш 2. Chronometer(s) wound. OPERATIONAL STATUS PAW ALPHA 2144 3. Held evening reports. M01221W Ø930 4. Magazines inspected. PISHERIFS 4b. Minimum temperature: 4a. Maximum temperature: 65 F 537 MACHINERY CONDITION AND BISCREPANCIES BRILLS AND TRAINING Туре Ended Began MIACH)NERY LOGS IAW ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES AV/LR5-23 KMTR IRC-G LUHF SQN-18 TAD On Board Auth. Attached Leave Other D-43. SWAISE 0557 SUNSET 1124

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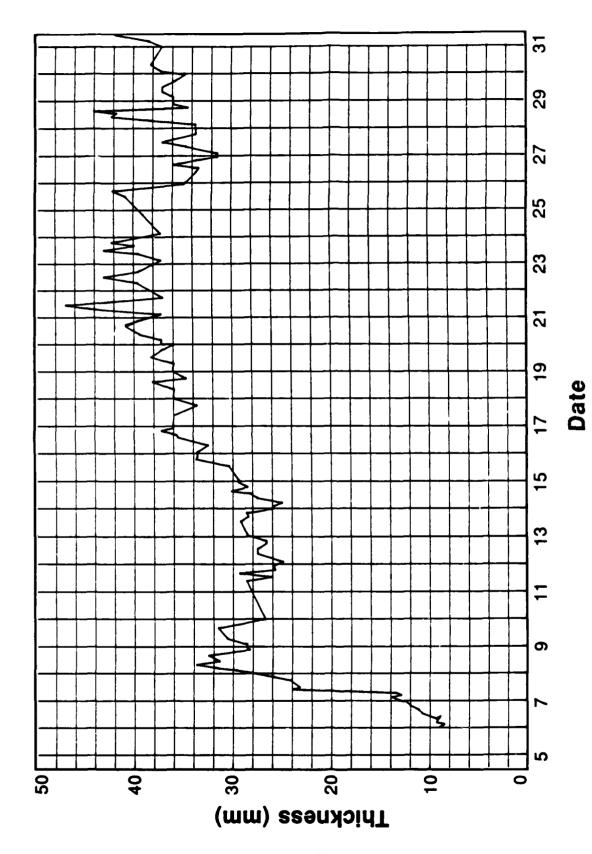


FIGURE D-1 Computed Values of Precipitable Water/NM for March Portion of CGC Vigorous Cruise

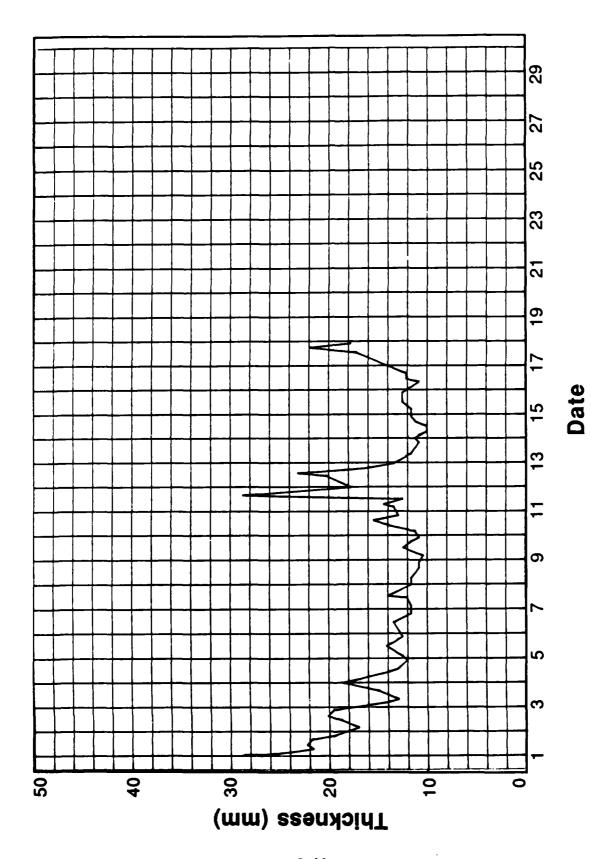


FIGURE D-2 Computed Values of Precipitable Water/NM for April Portion of CGC Vigorous Cruise

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SH S. COAST GUARD CC-43808 (Rev 3-67) CSSEC STATISM DATE ZONE DESTINATION TUGAMY DECISIVE (WMEC TOULDAY USCGC 624) 19 MAY 57 GHEBEC 1. WEATHER OBSERVATIONS EINOS IF TEMPERATURE ESTIMATED CLOUCS (Degrees) SEA WAVES SEA STELL TAVES DIRECT FREET WATER BIRECT-.1214 OF A THE O TIME MILES SASSMETER BIRECT. #E: 63.7 ht: 011 (Feed) 100 BILITY DET **851** AMBU m T TTPE TEMP. 108 (Knote) (Symbole) (inchee) 198 (True) (Miles) BUL 9 SEA LEVEL BUL D Dograda) Tentha) True 125 78 78 14 Ø KW 29.96 5 CN 13 74 120 CA LØ M 78 7 CALM 4 150 0 2 12 0 150 10 ID SCT 29.94 77 75 CALM 78 0.) CU 79 1 9 SC T <u>75</u> 113 10 170 29.92 78 75 calm 0.4 76 115 160 O lo 25.92 75 SC 05 124 155 KB 16 CAL M 29.92 CÙ 06 てん A 29.94 07 10 BKN 8 7 C 2 170 てム حب 0.0 110 CAL lSØ 10 CU Ø 30 96 CLI 100 15% 10 SCT 80 CALM 09 78 78 10 LOO ΙØ CAL140 29.99 1 Ø 8. ૪ 095 108 100 150 1 7 9 14 P IØ 29.99 82 78 AC 76 140 Ġ BKN 100 / Ø Ø 13 3 BKN 29.97 12 77 AC 100 10 8 76 100 140 73 14 Ø BKN 29.96 79 9 MC 17Ø D Z. j Ø 130 15 29.94 76 10 79 AL 110 2 [[Ø 10 BKN 140 3 130 29.92 82 10 BKN 26 6 AL 85 160 112 17 81 10 RKW 29.92 77 82 2 15CM <u>ں ب</u> 1 1 6 13 12-5 $\mathcal{B}\!K\!N$ 29.91 80 26 130 2 12 ·D 01 82 25 19 82 Ø 82 130 29.90 78 /30 12 100 Cリ 20 20 13 Ø 130 10 10 BKN 29.90 80 76 134 2 120 CU 21 14 9 120 <u>Ç</u> BKN 29.90 30 76 82 120 130 Z 10 **c** S 170 8 10 BKN 29.9Z 80 77 c S 82 170 120 23 29.93 O 80 170 120 10 77 4 47 AC. 130 24 5 10 10 SC T 24.93 80 ΑC 8 130 <A LM 101 5 11. OPERATIONAL SUMMARY STATUS AT 0001 CHECK LIST TIME IMITIALS MATERIAL CONDITION YOKE and I. Held quarters. lz 3Ø READINESS CONDITION 113Q 2. Chronometer(s) wound. PEFCON SUTATE JAMOITAPIS 19 45 ALFA 3. Held evening reports. MG1221M 4. Magazines inspected. PATROL 0970 ELT 4a. Maximum temperature: 4b. Minimum temperature: 98 640 MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING BOTH Began MNDES P/H/C Ended Type 9/1 IN 1252 1245 MAN OVERBOARD ELECTRONIC/COMMUNICATION COMBITION AND BISCREPANCIES CONTINUOUS RADIO GUARD TIO ON

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DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET TRANSPORTATION U. S. COAST GUARD CG-4380H (Rev. 3-67) ZONE BESTINATION DAY ₹653EC /478 F16# +4 QUEBEC 20 MAY 87 DECISIVE (WMEC 629) MEDNESDAY USCG C 1. WEATHER OBSERVATIONS - TINDS 15 TEMPERATURE CLOUCE ZEA SEA BAVES SUELL WAVES ESTIMATED (Degrees) STREET H RECT-= FORCE BEATHER BAROMETER ht: 41 DIRECT-VISI ã 106 TYPE TEMP. 100 100 WET AMBUN T BILLTY (Symbole) (Inches) 10# (Knots) (True (True) SUL S SUL S Tentha, (Miles) SEA LEVEL 81 140 1 AC 76 30 10 SCT 29.92 0 140 10 • • 81 120 7 AC 29.91 80 76 SC T 02 Ø 120 10 10 2 2 4 CU 81 140 110 76 29.90 80 0.3 140 10 10 SCI 0 7 90 140 CU 9 SCT 29.90 71 77 04 40 ıΦ Ø ٦_ 29.90 77 CU 80 140 5 05 Ø IØ SCT 9 /Y Ø 7 50 14 B CU 29.91 80 76 507 06 14¢ // IB 2 140 110 80 4 27.72 76 ヘリ 507 07 145 // 10 2 110 84 130 cu 29.93 26 0.0 11 Sci 80 7 130 10 130 Z 80 77 07 ں ے 120 29 95 82 Ø 9 10 BKN 9 120 BO 130 07 77 10 120 29.96 •0 10 BXN 82 120 84 120 05 77 1100 10 29.95 -0 9 RH 12 110 78 82 **ι3**Φ CAUM 29 98 06 83 120 09 10 BKN 12 82 120 CALM 79 29.47 Ō, 84 10 BKN LO 13 425 85 29.98 'υ 81 125 CALIM Φ. 10 BKN 14 3 ゅ LZO 10 CAL ଅ । でえど 29.96 Φ7 $\subseteq U$ i O 3 15 115 11 41 **C L** 82 120 130 86 30 5CT 29 95 16 7 Ø, 120 8 16 2 130 CU 87 090 82 MY 79.93 90 0 10 10 BKN 090 Z 120 120 83 C11 92 78 29.91 18 5 105 10 BKN 15 10 130 2 110 83 cu 77 2 8 BKN 29.91 19 100 10 77 19 130 13 CU 110 105 9 BKN 29.43 20 8 B 16 (30 78 2 29.93 79 S CU 110 9 ΙØ BKN 21 Ø 15 100 170 78 IJΦ 29.95 4 8 75 20 '4 110 (D SCT 22 10 1 78 19.96 4 CU 23 10 14 8 110 090 رں 80 29,97 77 14 507 4 10 7 11. OPERATIONAL SUMMARY INITIALS TIME CHECK LIST STATUS AT GOD! 1234 R MATERIAL COMOITION YOKE 1. Held guarters. 121 READINESS CONDITION 00 2. Chronometer(s) wound. DEFCON I 011 1945 OPERATIONAL STATUS 3. Held evening reports. ALFA ME1221M 1150 PATROL 4. Magazines inspected. 4b. Minimum_lemperature: 4a. Maximum temperature: CZ MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Type Ended Began P/H/C NO. MIDIE IN 0/1 ON LHR No MIDIE IN STBY ELECTRONIC/COMMUNICATION CONSITION AND BISCREPARCIES CONTINUOUS RADIA GHARD TND(OB On Board Legve TAD Other Auth. Attached D - 48SWELLE BEST しめ \overline{Q} SURSET 2023 O (7) Ø 0 NO.

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DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-43808 (Rev. 3-67) DAY DATE PART BESTIMATION TERREL SPECION 44 QUEBEL THUR 21 MAY 47 USCGE DEUSIVE (WMEC-(29) 1. WEATHER OBSERVATIONS 0314M1183 TEMPERATURE CLOUCS SEA SEA WAVES SWELL WAVES (Degrees) 3 FREEZ Bietet. BIBET. VI 51 -BEATHER BARDMETER . DI BECTtiet MET SE 007 BILITY WE T AMBUM T 1106 1687. 1 00 108 164 (Symbole) (Inches) (Knets) (True) (Miles) SEA LEVEL Out B Tenthe! Destage (True) 9 Q4 78 090 090 04 SCT 24.97 78 . 0.2 Ø5 24 78 095 ScT | 79 96 995 S 15 78 04 0.3 Ø75 29.95 75 10 BKN 78 06 CU 78 B75 Ø8 BKN 29.94 74 0.4 76 67 CU 80 120 0 Ø5 10 . BKW 29.93 78 80 120 0 0 CAI M ι COBKN 29.94 67 96 114 77 20 80 120 15 08 CAL LØ 0.7 167 NO 115 BKN CAUM 110 16 . 29.15 80 15 060 10 76 CU 75 070 080 09 14 7 82 76 075 29.47 CL 71 **670** @80 10 10 SCT 10 8 75 24 79 080 15 0 070 82 SCT 29.97 **Ø70** 10 11 80 12 Z 060 12 82 76 20 960 SLT 29.99 10 CA 12 Ø CA \$50 29.99 05 SCT 76 20 13 14 75 MODEED 09 25.95 16 90 115 10 511 81 04 <u>2</u> Ū 17 SCT 2993 03 650 15 80 150 10/0 16 81 055 SIT 29.52 Ø3 70 ,, 0 507 92 80 81 Ø50 20 21 10 SCZ 2494 74 OU C U1 15 28.96 14 Ź 507 22 フ怒 ては (0 10 23 LECA . 5/_7 25.90 16 O OU 14 29.96 80 101 II. OPERATIONAL SUMMARY STATUS AT GOOT CHECK LIST -TIME MATERIAL CONDITION YORE المعين 1. Held quarters. 1700 BEADINESS CONDITION DEFLOW I MCK 2. Chronometer(s) wound. 1017 SUTATE JAMOITARS 40 ALFA 3. Held evening reports. #13310m ELT 4. Magazines inspected. PATROL 0810 MZK 4a. Maximum temperature: 4b. Minimum temperature: 88. 64° MACHINERY CONDITION AND DISCREPANCIES BRILLS AND TRAINING BOTH 9/2 Began Ended Type ELECTRONIC/COMMUNICATION COMBITION AND DISCREPANCIES CONTUDUS KADIO GUARD TADKO On Board Auth. Attached Legre TAD Other D-49 Maist 17:45 MASCI ZOXO Đ Ø 0

DEPARTMENT OF TRANSPORTATION LOG. WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-43808 (Rev. 3-67) DAY **QUECEC** +4 DECISIVE (WMEC 629) ZZ MAY87 FRIDAY USCG C I. WEATHER OBSERVATIONS TEMPERATURE #1405 IF SEA TAVES SWELL WAVES SEA CLOUES PATER I BECT. HECT Ë BAROMETER 7186 BIECT-TREEK VISI -WEATHER. 1 MEI 4817 TYPE TEMP. 104 100 ... TE T BILITY (Inches) (Knots) (True) -Degree (Miles) SEA LETEL PUL S 4 76 CN 80 5 21,75 73 075 BKN 5 70 10 4 80 2 78 3 SC 21.44 74 <u>075</u> 10 SCT 17 02 14 9 4 SC 80 1 J 21.73 78 74 070 19 SCT 03 10 /4 4 80 Z ےد Ò <u> 29.9</u>2 74 04 13 20 Ø 055 SCT 90 060 4 5८ Z øvø 05 78 ZΦ **න**6Ø 675 3 cu 90 000 78 74 **3**CT 29.92 i2 465 30 /Ø 4 74 10 Z P75 くし Ø6Ø 79 3 . 29.93 Ø65 17 75 80 055 2 70 •• 29.94 13 IO 18 BKN 055 80 145 050 7 < (045 10 71 26 20 10 80 2 (J 045 060 フフ 27.95 10 1 21 042 10 230 29.96 76 6 20 030 18 80 81 86 78 7 <u>ں ی</u> 075 RKN 29.94 12 10 81 **663** 6 082 078 15 29 94 81 77 Ωد 80 100 みし 13 Ø55 Z 10 005 29.59 075 84 BK CU BO 064 5 14 10 84 CU 072 のてば 29 3Z BKN 00 14 070 ID 10 77 80 050 095 29.92 82 CLI 15 080 10 BKN 30 Ø74 (4 070 29.91 **S**くて 91 83 4 17 Ø 070 10 Ø74 つ 80 84 3 <u>ر</u> ن 90 274 2 10 SCT 29.41 18 ŧ Ø7Ø 12 3 82 77 8¢. acc. 1.70 3 29.91 13 10 5C T CL Ø 060 19 3 द्धा 80 79.97 3 ϕ 6 ϕ **0**70 SC7 76 CU 10 12 20 **07**Ø Ø7 Ø 80 **0**64 29.92 76 3 20 21 065 8 13 ゆ Z9.94 80 76 3 C U 40 Ø6Ø B 60 ĽΦ 12 SCT 22 50 2 **ቃ**6Φ SCT ВØ 23 Ø65 ID 6 13 29.91 80 2 181 11. OPERATIONAL SUMMARY TIME INITIAL S CHECK LIST STATUS AT GOOT MATERIAL COMOSTION 230 YOKE 1. Held quarters. MDITIONDS 227MIDATE 4 160 2. Chronometer(s) wound. DEFCON OPERATIONAL STATUS 1945 ALFA 3. Held evening reports #01221G# M735 4. Magazines inspected. PATROL 46. Minimum temperature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES DRILLE AND TRAIRING Type Ended Began ROTH A BANDON SHIPPROVIDE 1255 1234 ELECTRONIC/COMMUNICATION CONDITION AND DISCREPANCIES CONTINUOUS RADIO GUARD TADIOB D-50 Auth. Attached Leave TAD

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD OG-4380% (Rev. 3-67) v(\$311 ******* +4 QUEBEC USCOL DECISIVE CHIMEC 629 23 MAY 87 SATURDAY 1. WEATHER OBSERVATIONS U *1805 17 TEMPERATURE ESTIMATES (Degrees) CLOUCS SEA SEA WAVES SWELL WAVES DIRECT --PATER OTRECT-BILES BARDMETER -BI BECT. 1000 ä . BILLTY BAY TYPE 10# (Symbole) (Inchee) **W**f t AMBUST. TEMP. 100 100 (True) (Miles) SEA LEVEL BUL B (Tentha) -Degrees) (True) True <u>085</u> 29.95 09 5 C T 7 S 62 2 2 . Ø 78 8 2 14 29.84 78 D85 54 75 æ ں ے Z 03 80 18RA <u> 29.92</u> 75 64 80 <u>54</u> 080 .91 75 04 097 15 M CAL ΙØ 5C 10°0 80 14 79 **64** *ゆ*わ5 29.87 85 75 CU 10 SCT Z 090 76 क्य SC 70 06 10 80 07 050 BKA OID 75 80 06.5 0 c ω 7 08 075 070 10 77 74 6 CN 78 080 BKN 69 8 **Q**50 12 73 8 BKN/RW 24.47 77 7 CN 78 060 080 10 9 31 78 OCU 16 0 BKN 79.98 76 6 CU 060 Z Ø85 3 81 Ġ 8 10 29.99 76 4 78 @70 13 SCI CU C 70 2 080 3 29.99 12 OSP 91 CU 86 Ø SCT 090 085 2 76 1) 79.98 **P90 6**8Ø Ø85 8 13 IØ SCT 76 CU 80 7 14 070 13 1Ø 29.96 93 77 ВФ Ø76 Ø SCT 3 CU Z 080 • 83 **07**0 IØ 80 6 /ろ CU 080 3 **Ø**75 16 4 D 10 آےک 29.92 18 075 13 3 80 D75 3 20 100 17 072 BKN <u> 29.92</u> 96 79 80 080 6 077 2 87 80 085 7 80 085 2 19 10 29.91 SLT 2 20 Ø CTC 10 507 29.5Z 82 Cυ Z 29.94 D75 <u> 185</u> 50 21 (3 10 SCT \overline{C} 3 070 29.94 10 80 22 15 $C \cup$ 3 23 **074** 10 74 090 10 SCT 29 45 80 3 TO T 11. OPERATIONAL SUMMARY STATUS AT GOOL CHECK LIST TIME INITIALS MATERIAL CONDITION YOKÉ 1. Held quarters. MEADINESS CONDITION DEFLON I 2. Chronometer(s) wound. 10.20 $\mathcal{M}\mathcal{E}\mathcal{K}$ SHERATIONAL STATUS ALFA 3. Held evening reports. #13210m PATROL FL 4. Magazines inspected. 1100 4b. Minimum temperature: 4a. Maximum temperature: 88. BACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING IN LHESTE MZ Began Ended Туре ELECTRONIC/COMMUNICATION COMBITION AND DISCREPANCIES SUO D WITHOUS EADIO GUARD TRO/CB Auth. Attached Leave Other On Board TAD SM4131 00745 wiii1255 D-51 Ø Ø

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CC-4800 (Rev. 3-47) VESSEL-490-1100

LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET

ZONE BESTIMATION

USCGC DECISIVE (NMEC 629)

24 MAY 87 SATURDAY

+4 QUEBEC

							1. WEATH	ER OBSE	EVATIONS							
		168788	CSTIMATED					TEMPERATURE (Dogroom)		CT OR O 2		264	SEA VAVES		SWELL WAVES	
TIME	mires.		BIRECY- ION (True)	FORCE (Knots)		BEATHER (Symbolo)	BAROMETER (Inches) SEA LETEL	BRY BUL B	BUL B	MOUNT	TYPE	TEUP.	DIRECT- ION (True)	##: B# 1	OIRECT- ION (True)	# (; em ()
•	4	6	100	14	10	SCT	29.95	79	74	4	cu	79		2		3
9.2	1	7	070	14	10	SCT	29.93	78	75	4	Cu	79		7		3
03	6	Ø	050	11	10	SCT	29.92	78_	74	4	CII	79		1		3
94	-	2	960	11	10	SCT	29.91	79	74	4	10	78		1		3
05	7	1	075	16	10	SCT	29.90	78	74	4	CU	78		1		3
06	5	Z	070	15	10	SCT	29.94	78	74	9	10	7%		2		
07	5	5	060	16	10	BKN	29.95	78	74	6	(U	78	100	2	679	4
••	3	7	68C	14	10	RKN	29.96	28	74	7	ں ے	70	080	Z	086	3
00	4	9	085) É	10	BKN	29.97	75	75	5	<i>c</i> 0	84	085	2	085	3
10		D	085	17	10	SLT	29.98	79	75	4	cu	84	085	2	185	3
11	-	ÿ	085	17	10	37	29. 99	72	75	6	W	80	085	2	470 -	3
12	9	ঠ	010	16	10	BKN	29.98	79	76	7	CU	80	WOO		W9t	4
7.5	3		1255	14	100	BKN	27.99	79	7.5	7	CU	SP	U82	2	090	4
14	8	9	060	14	14	BKN	29.98	81	76	7	Ο υ		271	2	@75	3
12	C	0	070	13	10	BKU	29.99	81	75	7	(0)	84	<i>9</i> 75	2.	wo	4
10	6	2	440	15	10	BKN	29.96	83	76	6	CU	81	040	Z	060	4
17	6	5	050	16	(0)	BKN	29.94	83	77	.5	cШ	31	05C	Z	060	4
18	4	7	250	15	10	BKN	29.94	87	76	5	CLI	81	050	2	ECE	4
10	11	1	045	16	10	BKN	24.94	80	76	5	(U	81	250	て	ass	4
20	6	5	050	15	10	BKN	79.94	80	76	5	20	81	95p	Z	Ø6P	4
71	4	7	140	14	100	/3KN	79.96	78	74	6	(0	~	Ø40	Z _	060	4
11	3	8	100	18	10	BKN	29.96	78	74		20	18	100	Z	080	4
10	2	Z	ond	17	ID	BKU	79.97	78	74	6	(U	RI	Ø9Ø	Z	084	4
7	0	9	085	14	10	SLT	29.97	75	75	7	20	81	025	2	080	_ <
7	721	7	<u> </u>													
والمؤاهد	ارخوا						11. OPERAT	TIONAL SI	UMMARY							

8147WE AT 0001		C	HECK LIST			TIME	INITIALS			
YOKE YOUTH	1. Held q	ucrters	١.	-1945 ON						
DEFCON V	2. Chrono	meter(s) wound.		1130					
ALFA	3. Held evening reports. 4. Magazines inspected.					145	94			
ELT PATROL						1110				
	4e. Mexin	num ter	mperature:	4b. Minimum temperature:						
So of San Land Hill	DRILLS AND TRAINING									
THE THE PINC	Began Ended				Туре					
DE IN ERIC ON LHESTBY										
Manifella and discontinues (\$		_								
APIT STARD		1								
						TAJOB				
	D-52-	Auth.	Attached	Legve	TAD	Other	On Board			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	D-32 -	178	175	(n)	7		177			

DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET TRANSPORTATION U. S. COAST GUARD ZONE DESTINATION DATE USCGC DECISIVE (WIMEC 629 MONDAY 44 QUEBEC 25 MAY 87 1. WEATHER OBSERVATIONS ☐ WINDS 15 TEMPERATURE CLOUES 284 SEA BAVES SWELL WAVES CSTIWATED. (Degrees) PATER STORET. . V151-BAROMETER YOREE BEATHER BILES ă 1647. AMBUR 1 TYPE 100 ... WE T 10# (Inches) 104 (Symbole) **847. 8** (True) Miles SEA LETEL BUL B Tonthe. Degrees) 93 80 010 Z 3 **DED** 18 10 ScT 29.94 070 . Ø4 رں 80 1570 020 4 29.92 74 0.2 13 nb ScT 72 **070** 10 08 ں ے K B 72 74 03 064 BKN <u> 29.91</u> j b 10 84 74 Ø 4 0 BKN 29.50 0 4 13 0 10 140 1716 29.90 74 کن 80 3 Φï 78 9 10 10 BKN CX-C 13 BKN 29.90 80 11(2) 100 70 0 D65 100 06 065 74 BKN 29.91 80 WSD. 78 O $c \omega$ 07 als 0 4 CU 080 050 29.92 75 045 12 10 SCT 080 78 050 CL 80 76 12 BKN 29.93 2 10 MCK 78 76 050 Ø8¢ 3 81 CL .0 11 SCT 29 94 10 0.50 MCK Ø60 **/W** 1 070 29.95 81 76 71 7 13 10 SCT 060 3 05D 045 29.96 76 CU 070 13 IØ SCT 81 4 16 12 **U** 3 76 В 645 Ø PD 29.73 54 80 1) BKN 045 16 6 3 80 680 Ø5W PP 3C 75 Ø 447 50 Ø5Ø 080 40 IB **Ø**5Ø 17 SCT 13 УØ 045 080 20 SCT 79 10 <u> 29.88</u> 045 16 0 79 <u>a30</u> 507729 87 17 13 0.30 10 75 035 020 80 76 15 034 18 16 ID 5 80 041 045 25.86 80 16 1/25 15 16 3 @3¢ 76 30 6 Q40 BKN 29.888 80 < 4 MCK 20 040 14 10 3 5 CU 29.88 80) 76 80 BKN 21 14 050 15 10 3 50 76 SCI 29.89 79 2 CU8 15 10 22 060 3 24 30 7 23 SCT 89 15 <u>065</u> 10 80 Z 3 SCT 29.8 (Ø 7U 10 101 11. OPERATIONAL SUMMARY INITIALS TIME STATUS AT 0001 CHECK LIST 011 1230 MATERIAL COMDITION YCKE 1. Held guarters. 1026 READINESS CONDITION 11 EK 2. Chronometer(s) wound. FLON OPERATIONAL STATUS ALFA 3. Held evening reports. M13310H 11 YD 4. Magazines inspected. PATEN 4b. Minimum temperature: 4a. Maximum temperature: 641 MACHINERY COMBITION AND DISCREPANCIES DRILLS AND TRAINING Ended Type Began SET ZEBRA 1239 1328 60 MIN STRY ELECTRONIC/COMMUNICATION COMBITION AND BISCREPANCIES RADIO CONTINUOUS CUPER TAXOR Other On Board TAD Personnel Auth. Attached Leave 10 SUBBLE OF 30 Ø SUM SET 1145 D - 53004FT: FF0 407 60

DEPARTMENT OF TRANSPORTATION LOG. WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET IT. S. COAST GUARD CG-43808 (Rev. 3-67) DATE ZONE DESTINATION DAY WEST PROPERTY USCGC DECISIVE CLIMEC 679 76may87 TH QUEBEC TUESDAY I. WEATHER OBSERVATIONS U 41H02 17 TEMPERATURE SEA WAVES CLOUCS SEA SWELL WAVES ESTIMATED. (Degrees) DIRECT. E Di BECT-BAROMETER ā FRECE V151 -WEATHER BY BEET. 186 BILES : F = 2 AMOUN T TYPE TEMP. 100 100 **TE1** DRY 100 BILLTY (Symbola) (Inches) (Knota) (True) 807.8 (True) The (Milee) BEA LEVEL OUL S 29.88 2 Ø 79 76 ر ب 14 065 oct 81 CŪ 80 29.88 U 02 めつめ 15 ID SLT 13 79.88 CU Z 4 0.3 16 501 lФ 655 2987 Ø45 Z SCT 74 ں ب 78 80 04 lФ ر ب 29.87 80 05 3 10 SCT 28 24 258 29.87 78 80 ØY P 3 66 20 06 10 Z 060 80 dus 07 10 <u>BK x</u> 29.89 75 15 06 CU 645 260 80 Ø5Ø 2 10 80 75 ULS w 0.0 Ø 054 06Z 25.92 てぃ 450 7 BKN 81 76 0 049 10 060 BØ 2 BKU 29.94 60 12 81 75 **Φ**7 ID 10 2 29.54 76 07 0 002 10 76 350 350 Z 81 (4 82 24.94 SCT 12 324 10 91 35e 050 Z 29.93 76 CU 82 13 350 10 1 10 17 87 CAL 24.92 82 78 cU 3*5*Ø M 8 14 600 10 14 6 SCT < A4M CA 87 80 CU 29.71 87 1 15 2 0 005 G SCT 10 Z CAL **0**44 79 £ | /ø 29.9Ø 85 φZ \sim 50 app 16 /2 10 040 29.89 83 c U 81 ひてめ 5 ID 80 17 SCT oΖ 6 15 PSP 040 83 81 29.84 ØZ CU dzo 80 10 **SC7** 18 8 PID 034 OZ 83 40 20 81 01 B 501 29.88 € 005 ロめ 19 15 010 030 SLI 76 42 CU 94 -79 20 010 8 29.89 105 04 80 SCT 29.91 ں ہے フフ 21 80 1 BLN 29.93 フフ 05 22 25.53 20 30 354 04 SC7 23 14 350 2 CU モロ C+4 101 11. OPERATIONAL SUMMARY CHECK LIST TIME INITIALS STATUS AT 0001 MATERIAL CONDITION YOKE NEK 1225 1. Held quarters. IR READINESS CONDITION 1045 2. Chronometer(s) wound. DETTON 1945 OPERATIONAL STATUS ALFA 3. Held evening reports. D717 PATROL 4. Magazines inspected. 4b. Minimum temperature: 4a. Maximum temperature: 88 ° 62 MACHINERY CONDITION AND DISCREPANCIES DRILLS AND TRAINING Type Began Ended 1233 1332 GQ DRILL ELECTRONIC/COMMUNICATION COMBITION AND BISCHEPANCIES RADIO GUARD) CONTINUOUS TAD/OB Other On Board TAD Attached Leave Personnel Auth. 0 \$40.01.50 sunse T 1924 8 0620 D - 54BAAFT. AFT

DEPARTMENT OF TRANSPORTATION LOG. WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD 4390B (Rev. 8-67) DAY DATE ZONE BESTIMATION VERSEL CHARLE 629) +4 QUEBEC DECISIVE (WMEC 06 JUN 87 SATURDAY 1. WEATHER OBSERVATIONS BINOS IF TEMPERATURE ESTIMATES. CLOUDS SEA REA TAVER SWELL WAVES (Degrees) Ë MILES BIRCEY-75862 PATER ater IRECY. . 1214 TOE ATHER BAROMETER TIME #E1 BT ī () WE T AMBUN T TYPE TEMP. 100 BILITY BRY 1 0 m 108 (Knetz) Symbole (Inches) (True) (Miles) BUL B OUT. D Ton the SEA LEVEL Degrees) True True 83 2 82 070 4 15 29.81 80 30 050 Ø 010 SCT /H 81 83 80 7. 82 4 82 Sc. **070** 0250 29.71 4 Я 079 12 <u>۲۲/</u> 92 82 03 SC. 9 29 77 79 060 1Ø 79 83 04 sci 29.75 **070** 14 82 (5 4 4 Ø 07¢ lo 05 10 29.76 83 13 SUT 82 79 ı حن OE P 4 Ø 084 06 79 ゆをめ 0 29.78 <u>82</u> **680** ScT 16 07 83 3 100 SLT 82 79 CU dos 096 ID 29 80 84 0390 3 *0*99 LØ SC 29.81 ØØ løs 09 0 10 29.82 801 CU SC1 29.89 29.84 8 86 SC 10 0 10 82 00 UØ 1015 6 11 1000 3 LØ 50 .6 12 D RZWD 105 Sc 116 13 6 104 1 CDG 8 14 110 < 05 110 ID \mathcal{B} 105 14 18 110 (2) Ò 10 301 88 84 100 2 Ø75 <u>5 (</u> ロめ 16 4 44 OSU 190 17 10 501 SC **9**70 16 79. 49 88 39 84 18 19.74 5 36 09*9* Ø めっく 16 IØ SCT 29.79 45 84 4 Ø75 SCT 52 Ø9Ø 16 19 6 lB S 090 20 090 20 80 AS 83 4 10 SCT 29.80 100 0 7.00 83 79 21 SCT 3 93 C 90. Ø 090 10 29.8 Z 44 100 79 83 3 4 G Ø FC 33 040 22 090 20 9 24.83 100 (CTH 23 10 2 74 83 Ø90 4 19 83 CW 29.84 095 RKN/H 100 24 9 83 82 G Ø15 29.83 79 Zυ TO T 11. OPERATIONAL SUMMARY INITIALS STATUS AT -0001 CHECK LIST TIME MATERIAL COMDITION YOKE 1. Held guarters. READINESS CONDITION 2. Chronometer(s) wound. DEFCON I OPERATIONAL STATUS ALFA 3. Held evening reports. M | 2210H 4. Magazines inspected. ELT PATROL 4b. Minimum terberature: 4a. Maximum temperature: MACHINERY CONDITION AND DISCREPANCIES BRILLS AND TRAINING NO. P/H/C Began Ended Type M ١N 112 G۵ ON I HR STBY Ø16 NO. 047 <u>LM3Ø</u> STEERING CASUALTY ELECTRONIC/COMMUNICATION CONSITION AND SISCREPANCIES CONTINUOUS RADIO GUARD TAD/OP Other On-Board Auth. Attached Leave TAD D-55 SURR! SC 1062 **DUBSET** $\boldsymbol{\mathcal{b}}$ 1912 ID

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DEPARTMENT OF LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET TRANSPORTATION U. S. COAST GUARD CG-4860B (Bev. 8-47) ZONE DESTINATION DATE VESSEL PROPERTY 844 QUEREC DECISIVE (WMEC 629) WEDNEDMY LO JUN 57 USCG C I. WEATHER OBSERVATIONS UINOS IF TEMPERATURE SEA WAVES CL QUES SEA SWELL WAVES E BATER RECT 1 98 6 7 WEATHER BAROMETER 7 I M E **BILES** 111.1(4) 75127 V121-1 ā AMBUR T TYPE TEMP. 104 168 847 108 (Symbole) (Inches) (Knots) Ī True (True) (Miles) BUL S -Ton Me Degree SEA LEVEL 83 Z ŞC 010 78 100 87 4 18 10 SCT 29.83 8 100 3 83 3 5 5 C 090 090 83 78 SCT 10 29.82 62 4 22 0 010 5 79 085 080 cU 83 **29.82** 10 SCT 83 0.3 7 5 **Ø85** 24 3 83 ውናи **7**9 21 29.82 82 64 W 4 Φ IPP 83 4 CU OFO 2 OG A 05 82 82 9 79 21 ID 511 obio) 04 79 23 06 501 83 *ح* ن 26 OG S 10 Ø 83 84 83 100 Ø9S 07 83 567 20 / U DS 090 4 6 CU 83 <u> 110</u> 8 80 83 0.0 lØ2 25 BKN 29. LØ 4 090 83 CS 100 84 81 8 08 LOO LØ CS 83 29 44 83 00 ወየወ Ta 10 5 24 Ø OUC 84 LOI 83 86 25 690 86 10 100 .74 OV lØØ 71 <u>75</u> 96 12 øø 105 29.8 96 I Ø 12 8 72 4 b B १८ 82 4) 86 100 105 9 13 100 21 9 82 87 87 140 105 9.79 c S 14 4 3 I th 100 22 8 OVC 82 81 lO کے 100 95 15 OYC 100 8 Q# 71 OFF 81 **CS** 100 8 W 105 A) 210 OV 18 1092 100 23 8 IDOD 24 OVC lO 17 695 $I(\alpha x)$ 3 LØ 5 OVC 1004 18 2 6 3 1005 08 81 Ø95 84 \mathcal{U} DIC 20 108 19 090 82 80 83 100 AS 20 22 21.78 Ø 100 3 090 2 82 79 6 AS <u>83</u> Ø90 6 23 21 8 095 BKN 21.79 3 090 82 **090** 4 AS 23 6 29.8 79 2 5 090 21 8 23 જ 29.82 F 81 79 4 AS 83 095 3 090 6 2 Ø Ø15 MEK 20 2 8Z Ø80 7 3 084 29.83 82 28 3 23 20 0 68P 78 7 128 ø 11. OPERATIONAL SUMMARY INITIALS CHECK LIST TIME STATUS AT COOL 1225 MATERIAL CONDITION 1. Held quarters. YOKE READINESS CONDITION 2 1113 2. Chronometer(s) wound. DEFCON OPERATIONAL STATUS 1945 3. Held evening reports. ALFA MIZZIBO 4. Magazines inspected. PATROL 4b. Minimum temperature: 4a. Maximum temperature: 92 MACHINERY COMOITION AND DISCREPANCIES PRILLS AND TRAINING Ended Type P/H/c Began M/D NO O FRE AT SEA 1024 ON NO. Z HR. STBY ELECTRONIC/COMMUNICATION CONDITION AND BISCREPANCIES CONTINUOUS RADIO GUARD tagb8 Other On Board TAD Leave Auth. Attached D-56 -200 26 7 1105

DEPARTMENT OF TRANSPORTATION LOG - WEATHER OBSERVATION AND OPERATIONAL SUMMARY SHEET U. S. COAST GUARD CG-43808 (Rev. 3-67) ZONE DESTINATION v(\$38(*572714# 15JUN87 DECIME WHEC 629 USCGC 1. WEATHER OBSERVATIONS _ WINOS IF TEMPERATURE SEA WAVES CLOUGS 264 SEELL MAVES ESTIMATED (Degrees) DI RECT. IER IRS PATER ā ; BIRECTh [| 628 f (Feet) TRACE .1214 WEATHER BAROMETER MILES all liter. -.... 1647. 104 10# **W**E 1 DRY 104 BILITY (Symbole) (Inches) (Knots) (True) (Miles) SEA LEVEL 3 .98 Ø 085 1060 Ø BKN 085 . 29.97 82 80 80 085 10 0 2 2 085 82 0.3 Ø95 Ø8 82 LO BKN XO 0 4 14 Ø95 3 Ø 0.5 Ø BKN 8 087 82 090 694 06 £Ο BKN 80 Ø 15 82 090 OVC Ø75 **0**97 07 LO 349 090 074 78 ∞ 08 0 075 Z של של 3 0 30:0z 10 09 17 770 CO 85 BZ 0 090 BO.001 10 7پي 765 Z 82 80 CAD 14 BKN 30·0 14 8 OF 2 090 Ø60 BKN 30.01 86 090 81 12 2 10 2 8 BKN 30.01 91 Ø7 CU **6**70 13 8 B95 10 BKN 29.99 89 81 **99**0 070 81 Ø6 20 15 Ø95 14 81 Ø 70 2 81 07 CU 48 15 OPO 13 I Ø #80 Z 80 82 090 29.46 86 AS 9 3 090 10 DKN 16 490 1 090 Z 29.96 82 17 090 13 9 BKN 88 80 8 c 5 16 Z 090 29.95 79 8 **A** S 82 100 6 090 10 7 BKN 86 18 16 82 ۲ 7 A 5 £92 110 87 80 14 5 090 14 9 BKN 129.96 19 12 BUN 050 1/2 20 10 29.96 82 ں م Ø50 82 080 110 8 78 ₹ 29.96 21 10 14 かるむ SCT 82 7 F SCT 25.9> 81 4 ر ب DO 10 100 22 14 i 6 29 21 C 7 99 23 11 095 .99 lo SCT 29 ØØ C24 8 10 1 11. OPERATIONAL SUMMARY INITIALS CHECK LIST STATUS AT BOOT 2 24 MATERIAL CONDITION YOKE 1. Held quarters. 1100 READINESS CONDITION 2. Chronometer(s) wound. DETCONI OPERATIONAL STATUS alta 3. Held evening reports. MISSION 110 JPA1 4. Magazines inspected. erature: 4a. Maximum temperature: 4b. Minimum te MACHINERY CONDITION AND DISCREPANCIES PRILLS AND TRAINING Туре Ended Began ₽/ DEMOSTATION 185 2015 PYRO ELECTRONIC/COMMUNICATION CORDITION AND DISCREPANCIES DUTINUOUS KADIO GUARD TAD/OB TAD Other On Board Personnel Auth. Attached Leave SMENIAL COPPER 8 SUM SE T 1954 Ø D - 57ABALT: /80 6 AFT

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WEATHER DATA FOR DECISIVE CRUISE
--OBTAINED BY TELCON--

APPENDIX E

OBSERVATION SUMMARY MEMORANDA FROM SHIP PERSONNEL

A copy of the After Action Report of the Commanding Officer of the CGC VIGOROUS and a set of notes from watchstanders on his ship describing the use of the FLIR are reproduced in this appendix. Also a memorandum from the Commanding Officer of the CGC DECISIVE to the Commanding Officer of the R&D Center evaluating the performance of the FLIR is reproduced.

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From: Commanding Officer, USCGC VIGOROUS (WMEC 627)

To: Commander, Atlantic Area Coast Guard

Date: 28 April 1987

Subject: AFTER ACTION REPORT.... CRUISE 05 MARCH - 21 APRIL

1987

2. Comments/Recommendations

As requested by the Coast Guard Research and Development Center, VIGOROUS served as the testing platform for a forward looking infrared (FLIR) scope. The scope was mounted on the flying bridge six feet from our magnetic compass. The FLIR's proximity to the compass caused approximately eight degrees deviation when energized. It also caused a slight degradation to the lookout's night vision. A separate lookout manned the FLIR from one half hour after sunset to one half hour before sunrise. Eleven crew members stood a total of 374 hours on the "FLIR Watch." The FLIR is a valuable tool when searching for a specific target since nighttime profiling and sizing is Dedicating a specific watchstander to FLIR, accomplished. exclusive of the lookout, is not feasible for prolonged periods of time at present manning levels particularly while conducting special ops (i.e. -HMIO, fog navigation, towing, etc.). A remote bridge monitor for periodic scanning by bridge personnel or red-lens screening for the normal lookout's periodic scanning would help circumvent manning restrictions.

FLIR Notes from watchstanders

- 1. Most problems and criticism caused by the FLIR mount. Should be made sturdier with a wider base, similar to the BIG EYES binoculars. If the FLIR unit were made heavier, like the BIG EYES, our watchstanders feel it would be easier to handle since it would not be as prone to vibration.
- 2. All friction points on the FLIR should have bearings on it, instead of straight friction joints, to make scanning easier.
- 3. If possible, could the focus and magnification knobs be moved to the lens area of the FLIR? They were tough to reach while looking through the FLIR, and difficult to locate at night by feel alone.

4. Functional notes:

- usually always contacts were identified first through the BIG EYES rather than by the FLIR. This was also attributed to our not having had any unlit vessels at night not detected by radar.
- green display affects night vision. Could a red lens be placed on the display? That would not affect night vision at all, and therefore the regular lookouts could use the FLIR rather than having an additional lookout, as we had during the patrol.
- FLIR should be on a little higher stand; the flying bridge on the VIGOROUS had many obstructions (antennaes, the mast, the BIG EYES, etc.). The FLIR could do better a little higher to overlook those bridge obstructions.
- 5. Notable contact information: FLIR generally did not pick up contacts well down south. Up north, contacts were picked up at great distances, up to 10 miles. Temperature differentials was the answer. A regular nightscope may have worked better down south, since contacts did not appear that well. The FLIR picked up fixed fishing gear well up north, and information was relayed to the CONN in time to avoid. Conceptually, the FLIR would be perfect for man overboards.
- 6. Future configurations: TV monitor connecting FLIR to bridge watch; CO could then get more information on boarding targets at night before boarding party is sent over to vessels.
- 7. General findings: Besides for picking up unlit vessels at night, the FLIR, as configured and designed now, was more of a burden than help. With a red lens, sturdier base, and more solid construction, the FLIR would be a great aid for the lookouts. We recommend these modifications for the best implementation on Coast Guard units.



Commanding Officer
USCGC DECISIVE (WMEC 629)

c/o USCG Station 600 8th Ave SE St. Petersburg, FL 33701-5099 FTS: 826-3822

3980 17 Jun 87

From: Commanding Officer, USCGC DECISIVE (WMEC 629)

To: Commanding Officer, USCG Research & Development Center

Subi: EVALUATION OF SHIPBOARD MOUNTED FLIR

- 1. The FLIR (Texas Instruments Lightweight Shipboard Electro-Optical Sensor) was installed prior to our departure on 18 May 1987. The location selected for the most unobstructed view was the flying bridge adjacent to the lookout station. The nine-inch monitor was placed conveniently in an open cabinet, forward on the port side of the bridge and the power pack/video gear was oriented athwartships against the after bulkhead under the starboard window. All cables were led through the overhead and out a side window to the FLIR. Once underway, R&D technician, Mr. Bob Berry, conducted a briefing on the operation and capabilities of the FLIR with all the non-watchstanding petty officers who would be operators.
- 2. Our first night at sea was the clearest night in about three years. Outside Tampa Bay were many ships and small vessels with which to test the FLTR capabilities. The first ship observed was a 600 foot cruise liner that was visually confirmed at about six nautical miles. At about five miles, the stack became visible through the FLTR, and at about three miles the overboard discharge was identified. Not until a range of approximately two miles was the ship identified by type with the FLTR.
- 3. The FLIR was manned, in the beginning, from 2100 to 0500, and was used as a normal, scanning lookout watch. The first two nights of watch revealed that this would be counter-productive since our regular, flying bridge lookout was reporting contacts as usual at six to fifteen miles while the FLIR watch saw nothing. We rarely closed vessels to less than two nautical miles and small vessels of 100 feet or less were not visible beyond two miles. Continuous scanning tended to cause some eye strain, so scanning was done for five to ten minutes followed by a brief rest. In addition, the range/size reticle within the device proved to be distracting to the lookout. Night vision was not seriously impacted by the green light of the FLIR so the red filter was not used. The lack of contacts seen by the FLIR watchstander proved taxing, so we shifted the FLIR watch to an on-call basis, activated when we wanted to get a close-up view of contacts of interest.
- 4. We were unable to completely evaluate far, intermediate and near distances since FLIR's range ability was so limited. On the

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Subj: EVALUATION OF SHIPBOARD MOUNTED FLIR

occasions that we closed a vessel for LE purposes, the device did make available another window for details. It allowed us to observe vessel type and construction, monitor crew movement, and examine possible heat sources prior to illumination and boarding. Once the boarding was in progress, the FLIR became insignificant for that vessel. As comparison between the FLIR and the NVS-500 night vision scope, the NVS-500 is a more capable detector at a distance greater than two miles, but for close in detail, the FLIR is a better choice.

- 5. During our investigation of the F/V CLARIBEL, which contained over 30,000 pounds of marijuana, no particular heat was observed that could be identified as decomposing marijuana. However, if the vessel had been of fiberglass construction, that might have been different. The engine space and exhaust were clearly identifiable and, in another case, we were able to confirm that a vessel had been at anchor for some time due to the lack of heat detection.
- 6. Throughout the patrol, we had opportunities to encounter many types of vessels ranging from 800' tankers to 29' sailboats. Only on a very few occasions were any vessels visible through the FLIR at a range of over three miles. FLIR clarity became progressively worse the farther south we travelled. Between the latitudes of 15 and 12 degrees north we were not generally able to detect contacts farther than one mile, and there was considerable "fogginess" in the field of vision when scanning out from the ship beyond 1,000 yards. Within 1,000 yards the sea was clearly visible. Of particular note, during our patrol time between 12 and 13 degrees north latitude, our visibility was reduced to a maximum of eight miles as a result of red-brown Sahara dust blown west by the tradewinds.
- 7. After ten days of operation, the FLIR developed a full ground. Mr. Berry and DECISIVE's EMC attempted to identify and correct the problem, but a full ground remained in its power source. The equipment was secured until mid-patrol break arrival in Martinique where a Texas Instruments repair representative flew to meet us. The technician replaced the power source and the FLIR was again operational.
- 8. The FLIR in its present state of development is useful only as a supporting device and not as primary search equipment. Given the acquisition costs, technical maintenance and support required to keep the equipment operational and useful, its benefits do not appear to outweigh using familiar and reliable methods like a high powered spotlight and portable video camera. The pedestal mount, nine-inch monitor (with red filter), and yoke performed quite well, but resolution was a problem and the video

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Subj: EVALUATION OF SHIPBOARD MOUNTED FLIR

capabilities were peripheral to our procedures and require too much space. If the reticle was removed, and resolution was clarified considerably, the FLIR might be a fine addition to the fleet.

- 9. Having evaluated various lowlight level televisions in the past, I find them to have more capability than this FLIR and at a much lower cost. A WMEC needs a detection device that can sense targets at a range of five to ten miles and identify them at three to five miles. This allows for effective covert surveillance. Additionally, this device must be on a stabilized platform due to the movements inherent in a ship. The manning level on a WMEC 210' is insufficient to man a second lookout so remote control would allow the bridge watch to effectively use it.
- 10. DECISIVE was pleased to have been chosen as a testing platform for the FLIR equipment. It was a pleasure working with the R&D representative (Mr Frank Replogle) and technician (Mr Bob Berry) and having them aboard. I look forward to further results and developments in infrared technology and offer to provide any further assistance as a testing facility.

L. E. PARKIN

Copy: COMDT (G-OLE-3)

CG LANTAREA (OC)

CGD 7 (ole)

DATE ILMED